

REGULATIONS OF THE UNIVERSITY

In exercise of the powers conferred by Section 44 of the Tamil Nadu Dr.M.G.R.Medical University, Chennai Act 1987 (Tamil Nadu Act 37 of 1987) the Standing Academic Board of the Tamil Nadu Dr.M.G.R.Medical University, Chennai hereby makes the following regulations:-

1. SHORT TITLE AND COMMENCEMENT:-

These regulations shall be called as “THE REGULATIONS FOR THE MASTER OF SCIENCE (MEDICAL LABORATORY TECHNOLOGY)OF THE TAMIL NADU Dr. MGR MEDICAL UNIVERSITY, CHENNAI”.

They shall come into force from the academic year 2011-2012 onwards.

The Regulations and the Syllabus framed are subject to modification by the Standing Academic Board from time to time.

2. OBJECTIVES: -

To provide an extensive training in the fields of Biochemistry, Microbiology and Pathology to the students to enable them to supervise the entire laboratory.

3. ELIGIBILITY CRITERIA:-

Academic 2011 -2012

Candidates have a degree in B.Sc. Medical Laboratory Technology (MLT),B.Sc., Biochemistry, B.Sc. Microbiology.

The following Eligibility Criteria will be implemented from
Academic 2016 - 2017 onwards.

B.Sc. Chemistry (with ancillary subject of Biochemistry and Microbiology)
B.Sc. Microbiology, B.Sc. Biochemistry and Bsc. (MLT)

4. ELIGIBILITY CERTIFICATE:

Candidates who have passed any qualifying examination, as specified in Regulation No.3 above from any other Universities other than the Tamil Nadu Dr. M.G.R. Medical University before seeking admission to the affiliated institutions shall obtain an Eligibility Certificate from the University by remitting the prescribed fees along with the application form which shall be downloaded from the University website (www.tnmgrmu.ac.in).

5. REGISTRATION:

A candidate admitted to the Post Graduate Degree in Medical Laboratory Technology in any one of the affiliated institutions of this University shall register his/ her name with this University by submitting the prescribed application form for registration duly filled along with the prescribed fee and a declaration in the format to the Controller of Examinations of this University through the affiliated institution within 3 Months from the cut off date prescribed for the course for admission. The applications should have the date of admission to the said course.

6. DURATION OF THE COURSE:

The duration of certified study for the M.Sc (Medical Laboratory Technology) DEGREE COURSE UNDER ALLIED HEALTH SCIENCES shall be **TWO** academic years including period of examination. The admitted candidates should complete the course within double the duration (4 years) from the date of joining the course.

7. AGE LIMIT FOR ADMISSION :-

No Upper age limit for Admission

8. CUT OFF DATES FOR ADMISSION TO THE COURSE

Candidates admitted up to 1st September to to 30th September shall be registered to take up their first year examination from April / October of the next year, after fulfilment of the regulations.

All kinds of admissions shall be completed on or before 30th September of the academic year. There shall not be any admissions after 30th September even if seats are vacant.

9. COMMENCEMENT OF THE COURSE:

1st September of every year.

10.MIGRATION/TRANSFER OF CANDIDATES

Request for Migration/Transfer of candidates during the course of study from one recognized Institution to another recognized Institution of this University or from other University shall not be granted under any circumstances.

11.RE-ADMISSION AFTER BREAK OF STUDY

As per the procedure laid down in a common regulation for all the courses of the Tamil Nadu Dr. M.G.R. Medical University.

12.POSTING AND TRAINING IN OUTSIDE CENTRES:

The head of the postgraduate Department shall make necessary arrangements for the postgraduate candidates to undergo training in various skills in other centres.

13. MAINTENANCE OF LOG BOOK:-

- a) Every Post Graduate Degree candidate shall maintain a record of skills (Log Book) he / she has acquired during the two years training period, certified by the various Heads of Department, where he / she undergone training including outside the institution.b) The candidate should also be required to participate in the teaching and training programme in the cadre of undergraduate and post-graduate.
- c) In addition, the Head of the Department shall involve their Post-graduate Degree course candidates in Seminars, Journal Clubs, Group Discussions and participation in clinical.
- d) Every Post- graduate Degree course candidate should be encouraged to present short title papers in conferences and improve on it and submit them for publication in reputed medical journals. Motivation by the Heads of Departments is essential in this area to sharpen the research skills of

the post-graduate candidates.

- e) The Head of the Department shall scrutinize the Log Book once in every three months.
- f) At the end of the course, the candidate should summaries the contents and get the Log Book certified by the Head of the Department.
- g) The Log Book for each years should be submitted 3 months prior to the final year examinations.

14. DISSERTATION & EVALUATION:-

The topic of the dissertation should be submitted at the end of the first year and obtain the ethical clearance of the same. The candidate should also inform the name of the guide for the dissertation to the University while submitting the dissertations topic.

If there are changes in the dissertation topic, the same has to be informed six months prior to the final year examination.

The dissertation should be submitted duly signed by the Professor and the same has to be forwarded to the Controller of Examination through the Head of the Institution two months prior to the Examination.

For dissertation marks 200, Log Book & CME mark 50 and IA 50– Minimum mark to pass 150. For dissertation marks 200, Log Book & CME mark 50 and IA 50– Minimum mark to pass

* It was resolved XXXX111 S.A.B. Dated 19.12.2011.

If the dissertation is not approved (Failed) by the majority of the examiners, the results shall be withheld till the resubmitted dissertation is approved (Passed).

If the candidate fails in the Written / Practical Examination, but his / her dissertation is approved(Passed), the approval of the dissertation shall be carried over to the subsequent examination.

15 ATTENDANCE REQUIREMENT FOR ADMISSION TO EXAMINATION

a) No candidate shall be permitted to appear in any one of the parts of M.Sc., (Medical Laboratory Technology) Course Examinations, unless he / she has attended the course in all the subjects for the prescribed period in an affiliated Institution recognized by this University and has to produce the necessary certificates of study, attendance, satisfactory conduct and progress from the Head of the Institution.

b) A candidate is required to put in a minimum of 85% of attendance (of 270 days) each in theory and practical classes in each subject before admission to the examination.

c) A candidate lacking in the prescribed attendance and progress in any one subject in theory and practical classes, wherever necessary in the first appearance, shall not be permitted for admission to the entire examination.

d) CONDONATION OF LACK OF ATTENDANCE

There shall be no condonation of lack of attendance in Post Graduate degree programme.

16. COMMENCEMENT OF EXAMINATION:

15th April/15th October

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If the date of commencement of Examination falls on Saturday / Sunday or declared public holidays, the examination shall begin on the next working day.

17. MEDIUM OF INSTRUCTION:

The medium of instruction for all subjects shall be English.

18. AWARD OF DEGREE :-

The degree shall be awarded by the University only after the successful completion of the course.

19. AWARD OF MEDALS / PRIZES:-

The University shall award at its Convocation, medals and prizes to outstanding candidates as and when instituted by the Donors as per the schedule prescribed for the award.

20. PASSING MINIMUM:

A candidate shall be declared to have passed in each paper/subject if he / she secures NOT LESS THAN 50% of the marks prescribed for the examinations.

21. RETOTALLING & REVALUATION OF ANSWER PAPERS:-

Re-totalling & Revaluation answer paper is not permitted

22. NUMBER OF APPEARANCE/COMPLETION OF THE COURSE OF STUDY

The duration for completion of the course is double the duration of the course i.e. 4 years to pass the examination, from the date of joining the course. Otherwise he / she has to be discharged from the course.

23. CURRICULUM:- **FIRST YEAR:**

Paper - I	General Biochemistry, Medical Laboratory Technology
Paper - II	General Bacteriology, Immunology and Parasitology
Paper - III	Hematology and Clinical Pathology
Paper – IV	General Pathology,
Paper – V	Epidemiology & Biostatistics

SECOND YEAR:

Paper - I	Clinical Biochemistry, Endocrinology and Nutritional Biochemistry
Paper - II	Systemic Bacteriology, Virology and Mycology
Paper - III	Advance Haematology & Immuno Haematology
Paper - IV	Techniques in Histopathology and Cytology

Dissertation is to be submitted three months before the final year examination.

24. INTERNAL ASSESSMENT:

The Internal Assessment should consist of the following points for Evaluation:-

INTERNAL ASSESSMENT – SCHEME : 50 MARKS

Theory	Practical
30 marks	20 marks

The Internal Assessment of the candidate has to be assessed on the above points and a report has to be submitted by the institution as detailed below:-

The aggregate of Final Internal Assessment Marks should be submitted 2 months before the commencement of the exam as per scheme of examination shall be taken by the University as Internal Assessment Marks and minimum of 50% marks is mandatory for permitting the candidates to sit for the University examinations.

25. SCHEME OF EXAMINATION:

FIRST YEAR

26.

S.N	Subjects	Internal Assessment (IA)		Theory		Practical		Viva Voice	
		Max	Min	Max	Min	Max	Min	Max	Min
1.	General Biochemistry Medical Laboratory Technology	50	25	100	50	100	50	-	-
2.	General Bacteriology, Immunology and Parasitology	50	25	100	50	100	50	-	-
3.	Haematology and clinical Pathology	50	25	100	50	100	50	-	-
4.	General Pathology	50	25	100	50	100	50	-	-
5	Epidemiology and Bio Statistics	50	25	100	50	-	-	-	-

SECOND YEAR

S.N	Subjects	Internal Assessment (IA)		Theory		Practical		Viva Voice	
		Max	Min	Max	Min	Max	Min	Max	Min
1.	Clinical Biochemistry, Endocrinology and Nutritional Biochemistry	50	25	100	50	100	50	-	-
2.	Systemic Bacteriology, Virology and Mycology	50	25	100	50	100	50	-	-
3.	Advance Haematology & Immuno Haematology	50	25	100	50	100	50	-	-
4.	Techniques in Histopathology and Cytology	50	25	100	50	100	50	-	-

If a candidate fails in practical will only appear for Practical examination. If the candidate fails in Theory he/she has to write BOTH the practical paper and the RELATED theory subject.

Evaluation of Dissertation	200
Log Book & C.M.E. (minimum 2 per year)	50
IA	50
Total	300
Passing Minimum	150

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The candidates can appear for the final year examinations having maximum two first year arrear papers.

28. AUTHORITY TO ISSUE TRANSCRIPT :-

The Controller of Examinations shall be the authority for issuing transcript of marks after remitting the prescribed fee.

29. SUBMISSION OF PRACTICAL RECORD BOOKS :-

At the time of Practical Examination, each candidate shall submit to the Examiners his / her Practical Record Books duly certified by the Head of the Department as a bonafide record of the work done by the candidate.

The concerned Head of the Department shall evaluate and award the marks for the Practical Record Note Book and Log Book (Internal Assessment) and the Practical Record shall be presented to the Examiner at the time of examinations at the end of each year.

30. QUESTION PAPER PATTERN:-

Theory

Essay - 2 x 20 Marks = 40 Marks Short

Notes - 10 x 6 Marks = 60 Marks

100 Marks

Requirement for pass: 50% in each paper

SYLLABUS

First year

PAPER – I GENERAL BIOCHEMISTRY, MEDICAL LABORATORY TECHNOLOGY

General Biochemistry

Unit – 1

Structure of Cell and intracellular organelles

Carbohydrates, lipids, proteins and nucleic acids – structure, classification, properties, functions and Separation techniques

Membrane structure, glycoproteins

Unit – 2

Enzymes: Classification, factors that alter enzymes catalyzed reaction, Michaelis – Menton

Equation, Competitive and noncompetitive inhibition of enzyme reactions, regulation enzyme activity, Isoenzymes – separation and identification, plasma enzymes in clinical diagnosis. Coenzymes.

Unit – 3

Bioenergetics and Oxidative phosphoryation; free energy-exergonic and endergonic reaction, high energy phosphates, components of electron transport chain-mechanism of ATP production, Chemiosmotic theory, inhibitor of respiratory chain.

Unit –4

Carbohydrate Metabolism; Glycolysis, TCA cycle, glycogen, gluconeogenesis, blood glucose regulation, diabetes mellitus

Lipid Metabolism: Synthesis and breakdown of fatty acids, ketone bodies, DKA, Cholesterol, bile acids, lipoproteins, atherosclerosis.

Unit – 5

Protein Metabolism: Synthesis and breakdown of amino acids, urea cycle, specialized products from amino acids.

Unit – 6

Molecular Biology: Structure and functions DNA, organization and replication, transcription, protein synthesis.

Recombinant DNA technology

PCR

FISH

Unit – 7

Vitamins, Water and mineral Metabolism: Functions and deficiency manifestations of Vitamin A, D, E, K, C, B Complex. Water and electrolytes, calcium, phosphorus, magnesium, iron, lead, copper, trace elements (iodine, selenium, zinc).

Practicals:

General Experiments:

1. Preparation of buffers and determination of pH
2. Absorption spectra of aromatic amino acids
3. Colour reactions of aminoacids
4. Normal and abnormal constituents of urine
5. Body fluid examination
6. Qualitative analysis and identification of sugars
7. Separation of sugars by paper chromatography
8. Qualitative analysis and identification of amino acids
9. Separation of aminoacids by paper chromatography, TLC
10. Separation of Lipids by TLC
11. Agarose gel electrophoresis
12. SDS_PAGE and quantitation using densitometers
13. Separation of proteins, hemoglobin, lipoproteins b electrophoresis using agarose gel
14. Studies on enzyme kinetics using enzyme sources such as acid phosphatase from potatoes, alkaline phosphatase from liver – effect of pH, Temperature and substrate concentrations
15. Assessment of antioxidant status: Vitamin C and E, glutathione, MDA, Paraoxanose in serum
16. PCR
17. ELISA
18. Western blot
19. Chemiluminascence
20. Blood gas analysis
21. Karyotyping
22. Molecular weight determination by PAGE
23. Cell fractionation
24. Protein purification by
 - a) NH_4SO_4 Precipitation

Recommended books

1. Harper's textbook of Biochemistry
2. Principles of Biochemistry by Lehninger
3. Dr. Vasudevan

References:

1. Biochemistry by Voet and Voet
2. Molecular Biology by Griffith

Recommended books for practicals

1. Practicals Biochemistry – Plummer
2. Practical Biochemistry – Harold Varley
3. Tools in Biochemistry – Cooper
4. Lynchs Medical Lab Technology – Stanley S. Raphael

Medical Laboratory Technology

Unit -1

General Laboratory Techniques and procedures: Chemicals and related substance, general laboratory supplies, volumetric equipments and its calibration, centrifuges, balances and weighing, concept of solute and solvent, buffer solutions and their actions, physical and chemical units, units of measurements, safety measures.

Unit – 2

Specimen collection and processing: Collection and preservation of blood and urine, sources of biological variations, pre-analytical variables.

Analytical Techniques:

- A. Spectrophotometry, flame emission spectrophotometry, atomic absorption spectrophotometry, fluorimetry, nephelometry, turbidimetry, flow cytometry
- B. Electrochemistry – potentiometry, biosensors
- C. Chromatography – Theory, description of techniques of various types of chromatography, paper chromatography, HPLC
- D. Electrophoresis – Theory, description of techniques of various types of electrophoresis, technical considerations
- E. immunochemical techniques – basic concepts, antigen-antibody binding qualitative methods, quantitative methods.
- F. Centrifugation techniques
- G. Protein purification
- H. Recombinant DNA technology – PCR, western blotting, northern blotting and southern blotting.

Automation: Concepts, automation of analytical processes, integrated automation for clinical laboratory, automation of point of care analyzers.

Unit -3

Laboratory Operation:

- a. Selection and evaluation of methods: Basic concepts, accuracy - reference methodology, systematic error, analytical range, sensitivity and speciality, detection limit, interferences within run-precision, recovery

Assessing method acceptability:

- b. Establishment and use of reference value
- c. Clinical laboratory information-computer system, micro-computer applications laboratory information systems, future use of computers.

Unit-4

Laboratory Management and Safety: Health care delivery and financial strategies for managed care, financial management, human resource management and space and facility management. Lab safety-safety program, safety equipments, chemical hygiene plan. Hazards in the laboratory- identification of hazards, chemical hazards, clinical hazards, electrical hazards, biological hazards. Prevention of hazards.

Quality management: Fundamentals, total quality management, total testing process, control of preanalytical and analytical variables, control of analytical quality using stable control materials, external quality assessment, documentation of reports, proficiency testing new quality initiatives.

PAPER – II GENERAL BACTERIOLOGY, IMMUNOLOGY AND PARASITOLOGY

General Bacteriology

Unit – 1

Brief history of microbiology with special reference to the contributions of Louis Pasteur, Robert Koch and others.

Morphology and physiology of Bacteria

Classification and growth requirement of Bacteria

Principles and uses of different kinds of Microscopes

Unit- 2

Sterilization and disinfection procedures

Basic principles of Bacterial genetics

Cultivation methods

Antibiotic –antibiotic susceptibility testing.

Unit – 3

Sources and modes of transmission of infection with prevention of hospital acquired infection

Definition of Epidemic, Endermic, Pandemic and sporadic outbreak of diseases

Virulence factors of Bacteria

Practicals

Handling of microscope, staining methods

Preparation of media, inoculation methods

Preservation of cultures, anaerobic cultivation methods

Washing and sterilization of glassware, handling of equipment
Techniques of filtration, maintenance of quality control
antibiotic susceptibility testing

Molecular techniques

Immunology

Unit – 1

Antigen, antibody definition, examples

Antigen-antibody reaction – principles and their application in the diagnosis of infectious diseases.

Unit- 2

Immunity- classification, active immunity, passive immunity, innate immunity, humoral and cell mediated immunity, immunization schedule

Unit- 3

Hypersensitivity-classification, mechanism and example autoimmunity – mechanism and example tumour and transplantation immunology.

Practicals

Demonstration of agglutination precipitation, neutralization, fluorescent Antibody technique, immune blot technique, ELISA etc

Test to demonstrate CMI

Test to demonstrate hypersensitivity

Detection of ANA, Ds DNA etc

Parasitology

Unit – 1

Classification – protozoa-amoeba, flagellates, sporozoa, ciliates

Opportunistic parasitic infections

Unit – 2

Helminthes – cestodes, trematodes.

Unit -3

Helminthes- nematodes and diagnostic methods in parasitology.

Practicals

Stool examination for ova and cysts

Concentration methods

Peripheral blood smear examination

Special staining methods

PAPER – III HAEMATOLOGY AND CLINICAL PATHOLOGY:

Basic Principles of laboratory organization and safety

Sample Collection – principles of analytical, pre and post analytical errors

Reception, labelling and recording of laboratory investigations

Cleaning of glassware, pipettes, E.S.R tubes and counting chambers

Preparation of capillary pipette, distilled water, reagents, buffers

Collection of blood, preparation of blood smear, staining of blood and bone marrow smears.

Genetics

Continuity of life - heredity, variation; mendl's laws of inheritance, chromosomal basis of inheritance; other patterns of inheritance , mutation and chromosomal aberrations;

Human genetics - methods of study, genetic disorders.

DNA as a genetic material - its structure and replication; structure of RNA and its role in

protein synthesis; Gene expression - transcription and translation

Basic techniques in Molecular Biology and cytogenetics

Equipment relevant to lab haematology and transfusion medicine including

Mircoscope: Light, phase contrast, interference, fluorescence, polarization and electron microscopy (principle, parts and its application)

Photometry: Basic principal UV-Vis spectrometry and colorimetry instrumentation and its application

Fluorimetry: Principal, Instrumentation and application

Electrophoresis: Principal, types and application (agrose gel electrophoreses, starch gel and polyacrylamide electrophoresis)

Centrifuge: Basic principle, type analytical and preparative centrifuges, different density gradient centrifuge and analytical with its application

Blood analyzer: Principal, instrument and its application

Incubator, hot air oven and autoclave: Principal, instrument and its application.

Radioactivity: Radioisotopes, half life units, Geiger Mueller counter, gamma counter and scintillation PH meter (principle types, types of electrodes and application)

Freezers, coolers platelet agitators, cryo thawing baths

Automated immunohaematology analysers

Automated coagulation analysers, platelet aggregometers and thromboelastogram

Haemopoiesis

Red Blood Cells : Normal erythropoiesis, morphology

Red cell disorders – inherited and acquired

Anemias – classification, pathophysiology and diagnosis

Haemolytic disorders

Malignant disorders

White Cells – Normal myelopoiesis,

White cell disorders - inherited and acquired

Malignant disorders – classification, pathophysiology and diagnosis

Platelet disorders – classification, diagnosis and pathophysiology

PAPER – IV GENERAL PATHOLOGY

Unit-1

General introduction to pathology causes of cell injury, cell injury and necrosis

Apoptosis and sub cellular responses to cell injury

Cellular responses to growth and differentiation, pathologic calcification

Acute and chronic inflammation, morphologic patterns of acute and chronic inflammation, systemic effects of inflammation

Complements and their functions

Cytokines and their functions

Intracellular accumulation, gangrene – pathology and classification, pathogenesis and classification of edema, reticulocyte structure

Pathogenesis of thrombosis, embolism, infarction and shock

Unit-2

Control of normal growth, cell cycle illustration and the regulation of cell division, labile cells, stable cells, permanent cells, molecular events in cell growth (autocrine signalling, paracrine signaling, endocrine signaling), cell surface receptors, signal transduction systems and transcription factors.

Growth inhibition, growth factors, extra cellular matrix and cell matrix interactions, collagen, elastin, fibrillin and elastic fibres, adhesive glycoproteins and integrins, matricellular proteins, proteoglycans and hyaluronidase.

Repair by connective tissue-angiogenesis, growth factors and receptors for angiogenesis, extra cellular matrix proteins as regulators of angiogenesis.

Fibrosis, tissue modeling, wound healing, healing by first and second intention

Haemo dynamic disorders – hemostasis and thrombosis.

Unit-3

Genetics (molecular basis of human diseases, production of human biologically active agents, gene therapy, disease diagnosis, mutations, mendelian disorders, autosomal dominant disorders, autosomal recessive disorders and X linked disorders

Biochemical and molecular basis of single gene disorders.

Disorders with multifactorial inheritance, normal karyotype, fluorescence in situ hybridization, cytogenetic disorders involving sex chromosomes.

Diagnosis of genetic diseases. Direct gene diagnosis, indirect gene diagnosis, linkage analysis.

Unit – 4

Neoplasia, Nomenclature, characteristics of benign and malignant neoplasms

Molecular basis of cancer, oncogenes and cancer, protein products of oncogenes

Activation of oncogenes, point mutations, chromosomal rearrangements, gene amplification, cancer

Suppressor genes, protein products of tumor suppressor genes.

Molecules that regulate nuclear transcription and cell cycle, Rb gene, P53 gene, BRCA-1 and BRCA-2 gene, molecules that regulate signal transduction, cell surface receptors, other tumor suppressor genes. Genes that regulate apoptosis and DNA repair, Telomeres and cancer, molecular growth, Kinetics of tumor cell growth, tumor, tumor angiogenesis

Lab diagnosis of cancer.

Practicals

Polymerase chain reaction

In situ hybridization

Cytogenetics

Unit - 5

Infectious diseases, new and emerging infectious diseases, categories of infectious diseases in brief, special techniques for diagnosing infections

Tuberculosis-etiology, pathogenesis and lab diagnosis

Leprosy – etiology, pathogenesis and lab diagnosis

HIV- epidemiology, pathogenesis and lab diagnosis

Practicals

Western blot

Northern blot

Southern blot

CD4 CD8 counts

Systemic pathology

PAS (Periodic Acid-Schiff) stain

Romanowsky stain

Stain for micro-organisms

Argentaffin and argyrophil stains

Amyloid stains

Reticulin stains

Trichrome stains

Phosphotungstic acid hematoxylin stain (PTAH)

Stains for hemodierin (Perls), melanin (Fontana) and calcium (von Kossa)

Stains for neutral lipids

Mucin stains

Glemsa stain

Elastics fibers

Myelin stains

Enzyme histochemistry and immunoenzyme technique

Immunohistochemistry and the various immunohistochemical stains in the diagnosis of various disorders

Tissue of special interest – nervous system

Hard tissue

Miscellaneous cells

Endocrine cells

Cytology technique

Quantitative methods

Autoradiography (specimen radiography)

Microincineration

Museum technique

Specimen photography and microphotography

Microscopy

- General microscopy
- Dark ground microscopy
- Immunofluorescence and fibers and formaldehyde induced fluorescence
- Fluorescence microscopy
- Polarizing microscopy
- Phase contrast microscopy
- Electron microscopy

Flow cytometry

Other methods for analysis of cell proliferation and Nucleolar Organiser region evaluation polymerase chain reaction and application of PCR technology in Pathology cytogenetics interphase cytogenetics

PAPER – V EPIDEMIOLOGY & BIostatISTICS

Epidemiology:

1. Epidemiology - definition, concept and role in health and disease.
2. Definition of the terms used in describing disease transmission and control.
3. Modes of transmission and natural history of a disease
4. Measures for prevention and control of communicable and non-communicable disease.
5. Principal sources of epidemiological data.
6. Definition, calculation and interpretation of the measures of frequency of diseases and mortality.
7. Need and uses of screening tests.
8. Accuracy and clinical value of diagnostic and screening tests (sensitivity, specificity, & predictive values).

9. Causal Association & Various types of epidemiological study designs

10. Critical evaluation of published research

Biostatistics:

Frequency distribution: diagrams, characteristics of a frequency distribution

Basic distribution statistics: measures of central tendencies

Measures of variation/dispersions

Confidence intervals

Measures of accuracy and precision

Statistical sampling methods

Basic for statistical inference

Sampling distribution

Statistical inference

Statistical inference

Type I and Type II errors

Parametric comparison of populations

The null hypothesis and statistical significance

Comparison of means test including paired test

One way analysis of variance (Anova)

Non Parametric distribution statistics

Sign test

Mann-whitney rank sum test

X^2 (Chi Square) test

Linear regression and correlation

Scatter diagram

Correlation coefficient

Regression coefficient

Multiple regression

Sensitivity, specificity and predictive values

Receiver – operating characteristics curve.

SECOND YEAR

PAPER – I CLINICAL BIOCHEMISTRY, ENDOCRINOLOGY AND NUTRITIONAL BIO-CHEMISTRY

Clinical Biochemistry

Unit -1

Clinical Enzymology: Enzymes in plasma and their origin, general principles of assay, clinical significance of enzymes and isoenzymes, Measurement of serum enzymes in diagnosis – cardiac and skeletal muscle enzymes, liver and biliary tract enzymes digestive, **bone and gi disorders**.

Unit-2

Disorders of carbohydrate metabolism: diabetes mellitus – diagnosis, gestational diabetes mellitus, role of laboratory in diagnosis and prognosis in diagnosis and prognosis, hypoglycemia. Determination of glucose in body fluids, ketone bodies, lactate and pyruvate. Glycated proteins, urinary albumin excretion –specimen collection, storage and quantitative assay. Qualitative tests for individual sugars in urine.
Inborn errors of metabolism

Disorders of Lipid Metabolism: Atherosclerosis and coronary artery disease. Disorders of lipoprotein metabolism. Measurement of lipids, lipoproteins and apolipoproteins. Sources of analytical and biological variations in measurements.

Disorders of protein metabolism: plasma proteins, proteins in body fluids. Analysis of proteins in blood and other body fluids. Electrophoresis of plasma proteins. Aminoacidurias-selected disorders of amino acid metabolism-phenylalanine, tyrosine, alkaptonuria, melanuria, cystinuria, homocystinuria, **cystinosis**, organic acidurias. Analysis of amino acids – screening test, quantitative tests for specific aminoacids.

Unit-3

Disease related to organs: Liver- LFT, Jaundice, hepatitis, cholestasis

Kidney- RFT, renal failure, uremia, nephritic syndrome, renal calculi, renal tubular acidosis, diabetes insipidus, dialysis. Early markers of renal pathology – microalbuminuria, albumin: creatinine ratio.

GIT- Gastric and pancreatic function tests, pancreatitis, malabsorption syndrome.

Unit – 4

Electrolytes and blood gas analysis – specimens for electrolyte determination- sodium, potassium, chloride, bicarbonate, determination of pCO_2 , O_2 and pH.

Unit – 5

Miscellaneous topics: Composition of CSF, meningitis, encephalitis, cancer, oncogenes, tumour markers, AIDS- basic concepts, diagnosis, Cytokinetics.

Endocrinology and Nutritional Biochemistry

Unit – 1

General concepts of endocrinology- the endocrine system, hormones- chemical nature, classification, hormonal action- receptors, hormone receptor interaction, regulation of gene expression by hormones, second messengers (camp, GMP, Ca++) Protein kinase cascade. Concepts of hormones assay.

Unit- 2

Hypothalamus and pituitary- anatomy, chemistry, functions, regulation. Diseases related to the hormones of these glands. Assessment of anterior and posterior pituitary.

Unit – 3

Thyroid anatomy, chemistry, synthesis, functions, regulation, thyroid function test in various abnormal conditions, parathyroid – anatomy, chemistry, synthesis, functions, regulations, diseases of parathyroid glands.

Hormones involved in calcium and phosphate metabolism. Diseases related to its metabolism. Calcium chemistry and functions.

Unit- 4

Adrenal cortex and medulla – anatomy, chemistry, synthesis, metabolic effects, pathophysiology of the adrenal cortex. Assessment of adrenal functions, Gonadal hormones – anatomy, chemistry, functions, regulations and diseases related to these glands. Endocrinology of male and female infertility, pregnancy and lactation.

Unit – 5

Gastrointestinal and pancreatic hormones – chemistry, synthesis, metabolic effects, regulation, diseases related to the hormones of these glands. Detection of anomalies.

Unit - 6

Nutritional requirements of carbohydrates, proteins and lipids. Deficiency states of carbohydrates, proteins and lipid. RDA, Nutritional requirements of vitamins (fat and water soluble)- Structure, functions, deficiency states, dietary source, Nutritional requirements of macro and microelements- functions, deficiency states, dietary source, RDA.

Practicals

Procedures using automated analyzers

1. Estimation of blood glucose, GT, glycated haemoglobin, fructosamine, urine microalbumin.
2. RFT- Estimation of blood urea, serum creatinine, uric acid, GFR, urinary proteins, protein, Creatinine ratio.
3. LFT – Estimation of total bilirubin, total protein, albumin, SGOT, SGPT, ALP, GGT
4. Lipid profile- total cholesterol, triglycerides, HDL, LDL

5. Cardiac enzymes – creatinine kinase, CK- MB, LDH
6. Pancreatic function tests – amylase.
7. Estimation of calcium, phosphorous, magnesium, iron
8. Electrolytes
9. Quantitative analysis of urine- protein, uric acid, creatinine, calcium chloride
10. Analysis of CSF
11. Hormones: Thyroid profile- FT2, FT4, TSH, Fertility profile – LH, FSH, prolactin, estradiol, testosterone; cortisol, insulin
12. Tumor markers : P:SA
13. CAD risk assessment: Apo A, Apo B 100, hs Homocysteine, Lp(a)

PAPER – II SYSTEMIC BACTERIOLOGY, VIROLOGY AND MYCOLOGY

Systhemic Bacteriology

Unit – 1

Gram positive cocci- staphylococci, pneumococci,

streptococci Gran Negative cocci – N. Ggonorrhoeae, N.

meningitides **Unit – 2**

Gram positive bacilli- corynebacteria, Mycobacteria, Clostridia, Actinomycetes Bacillus Anaerobes

Unit- 3

Gram negative bacilli – Enterobactericeae, Pseudomonas, Vibria Brucella, Bordetella, Haemophilus, Yersinia

Unit – 4

Spirochetes – Treponema, Leptospira, Borrelia

Rickettsiae, Chlamydiae, Miscellaneous bacteria

Practicals

Introduction of Clinical specimen, identification of bacteria, staining methods

Biochemical tests, antibiotic sensitivity testing

Darkground microscopy, special staining methods, use of experimental animals

Food milk and water bacteriology

Air Sampling and theatre sterility

Virology

Unit – 1

Classification and general properties of viruses – interferon, inclusion bodies

Cultivation of viruses and laboratory diagnostic methods of viral diseases

Unit – 2

Pox virus, herpes virus, myxoviruses, enteroviruses

Unit - 3

Rabies, Arbo viruses, hepatitis, HIV, viruses causing gastro enteritis, miscellaneous viruses

Practicals

Tissue culture methods

Fluorescent microscopy, ELISA, PCR

Mycology

Unit – 1

General properties of fungi, cultivation methods, laboratory methods of diagnosing fungal infection.

Unit - 2

Superficial and deep fungal infections, opportunistic fungal infection

Mycotoxins

Practicals

Identification of fungi, microscopy, culture, special staining methods

References:

1. Practical medical microbiology – Mackie and McCartney – latest Ed
2. Medical microbiology – David Green Wood, Richard – latest Ed
3. Medical lab Manual- Vol I and II – ELBS
4. Manual of Clinical Microbiology – latest Ed
5. Lab immunology and serology – N – Bryant
6. Textbook of Diagnostic Microbiology – Conne R. Mahon and George – WB Saunders 2nd Ed

Journals

1. Journal of Microbiological Methods
2. IRCS- Microbiology, Parasitology and infectious Diseases
3. Journals of Parasitology

PAPER – III ADVANCED HAEMATOLOGY AND IMMUNOHAEMATOLOGY

Coagulation disorders and basics of their work up

Thrombotic disorders and basics of testing

Automated cell counters and coagulation analysers – principles

Manual Haemoglobin and Counts

Peripheral smear –Preparation and Interpretation

Manual tests of coagulation, factor assays

Urine and stool – analysis, micro and interpretation

Immunohaematology:

Basic Genetics and immunology

ABO and Rh blood group systems

Other major blood group systems – clinical significance of

Compatibility testing, Antibody screening and identification, clinical significance

of Choice of reagents and QA of the same

Donor Screening and bleeding

Blood bags, Anticoagulant and preservative solutions

Blood Components – preparation, Quality control

Apheresis

Infectious disease screening

Transfusion reactions, Haemolytic Disease of the Newborn

Some basics of appropriate use of blood

Choice of blood in specific clinical scenarios – HDN, Multiply transfused etc

Basics of HLA typing and anti HLA antibody detection

PAPER IV TECHNIQUES IN HISTOPATHOLOGY AND CYTOLOGY

Unit -1

PAS (Periodacid – Schiff) Stain

Stain for micro-organisms

Argentaffin and argyrophil stains

Amyloid stains

Reticulin Stains

Trichrome stains

Posphotugstic acid hematoxylin stain (PTAH)

Stains for hemosiderin, Melanin and CA

Stains for neural lipids

Mucin stains

Giemsa Stain

Elastic stain

Myelin stain

Romanowsky stain

Unit - 2

Enzyme histochemistry and immunoenzyme techniques

Immunohistochemistry and the various immunohistochemical stains in the diagnosis of various -disorders

Tissues of special interest – nervous system

Hard tissue

Miscellaneous cells

Endocrine cells

Unit – 3

Cytology techniques

Quantitative methods

Micro incineration

Unit – 4

Autoradiography

Museum tech

Specimen photography and microphotography

Unit -5

Microscopy General

Microscopy

Dark ground microscopy

Immunofluoresence