



Dr. D. Y. Patil Vidyapeeth, Pune
(Deemed to be University)

Syllabus for

M.SC

MEDICAL BIOCHEMISTRY

2018-2019



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SYLLABUS
FOR
M.SC
MEDICAL BIOCHEMISTRY

Theory Syllabus
Paper I (GENERAL BIOCHEMISTRY AND INSTRUMENTATION)

- 1) History & scope of Biochemistry.
- 2) Cell structure & biochemical functions .Membrane structure & functions.
- 3) Transport through biological cell membrane
- 4) Chemistry & biological importance of carbohydrates ,proteins & amino acids, lipids , nucleic acids, porphyrins glycosaminoglycans, glycoproteins.
- 5) Chemistry of blood & hemoglobin, plasma proteins, Blood coagulation.
- 6) Enzymes & coenzymes –chemistry ,nomenclature properties & mode of action of enzymes,Enzyme kinetics, factors affecting enzyme activity, enzyme inhibitions,applications of enzymes & isoenzymes.
- 7) Bioenergetics & biological oxidation-General concept of oxidation & reduction.Electron transport Chain (ETC)- functioning of ETC & inhibitors of ETC, Oxidative phosphorylation,Uncouplers and theories of Biological oxidation & oxidative phosphorylation.
- 8) Principle, working & applications of, a) Colorimetry b)Spectrophotometry c)Flame photometry d) Flurometry e)Atomic absorption spectroscopy g) ultra centrifugation
- 9) Principle, types& applications of , a)Electrophoresis b)chromatography
- 10)Autoanalyzers, Blood gas analyzers
- 11)Automation in clinical chemistry
- 12)pH, electrodes & methods of pH determination.
- 13)Basics of Mass spectroscopy, Nuclear Magnetic Resonance, chemiluminescence and Electron - microscopy
- 14)Environmental Biochemistry – Definition, importance of pollution free & ecofriendly environment, exposure to cold stress, exposure to heat , air pollution water pollution & food pollution
- 15)Immunochemistry – The Immune system, Immunoglobins, antigen –antibody mediated immunity, mononuclear phagocytes –macrophages ,elements of clinical immunity.

Paper- II: METABOLISM AND NUTRITION

- 1) Digestion & absorption from gastrointestinal tract.
- 2) Intermediary metabolism, metabolism of Carbohydrates, Lipids, Proteins , and Amino acids , Nucleic acids, Hemoglobin, metabolic control, energy production & regulation.
- 3) Metabolic interrelationships & regulatory mechanisms
- 4) Metabolic changes during starvation
- 5) Energy metabolism-Calorimetry, BMR- its determination & factors affecting it, SDA of food.
- 6) Macro & micro –elements & their role in health & disease, water metabolism & its regulation.
- 7) Vitamins- chemistry, biological importance, deficiency manifestations & recommended daily allowance.
- 8) Principles of Nutrition –Balanced diet & its planning, Nutritive importance of various food sources, Calorific value of food , toxins & additives , Obesity, Protein Energy Malnutrition (PEM)- Kwashiorkor& Marasmus .
- 9) Diet in management of chronic diseases viz, Diabetes mellitus, Coronary artery disease, Renal disorders, Cancer, Hypertension, Anemia, Rickets& Osteomalacia.
- 10) Diet for overweight person, pregnant woman and during lactation

PAPER –III CLINICAL BIOCHEMISTRY

- 1) Chemistry, composition & functions of lymph, CSF, ascitic fluid, pleural fluid, & synovial fluid.
- 2) Urine formation, excretion & urine analysis.
- 3) Composition, chemistry & functions of specialized tissues like muscle, bone, nerve, connective tissue, & brain adipose tissue.
- 4) Chemistry of respiration & acid base balance & imbalance
- 5) Hormones-: Communication among cells & tissues. Hormone- General mechanism of action of hormones, chemistry, functions, synthesis of steroid hormones, polypeptide hormones, & thyroid hormones. Chemistry & functions of hormones of pancreas, and parathyroid. Local hormones. Clinical disorders of hormones, Hormone receptors.
- 6) Biochemistry of Diabetes mellitus, Atherosclerosis, Fatty liver, and obesity.
- 7) Organ function tests
 - a) Liver function tests
 - b) Kidney function tests
 - c) Thyroid function tests.
 - d) Adrenal function tests
 - e) Pancreatic function tests
 - f) Gastric function tests
- 8) Radioisotopes & their clinical applications.
- 9) Biochemistry of aging.
- 10) Neurochemistry in Health & Disease.
- 11) Biochemical changes in pregnancy & lactation.
- 12) Water & electrolytes balance & imbalance.
- 13) Total Quality Management of Laboratories.
 - a) Internal Quality control
 - b) External Quality control
 - c) Accreditation of laboratories
- 14) Basics of Medical statistics
- 15) Inborn errors of metabolism.
- 16) Biotransformations of Xenobiotics
- 17) Basic concepts of Biochemical Defense Mechanisms

Paper IV

MOLECULAR BIOLOGY , BIOTECHNOLOGY & RECENT ADVANCES IN CLINICAL BIOCHEMISTRY

- 1) Central dogma, genetic code, protein biosynthesis & its regulation.
- 2) DNA: structure, functions, replications, Mutation & repair of DNA,
Sequencing of nucleotides in DNA, Mitochondrial DNA, and DNA recombination.
- 3) RNA: composition, types, structure & functions.
- 4) Role of Nucleic acids in diagnosis of Molecular diseases & infectious diseases
- 5) Mitochondrial DNA & diseases.
- 6) Human Genome Project.
- 7) Genes & chromosomes, Gene mapping, Chromosome walking etc.
- 8) Gene expression & gene amplification & gene regulation, Oncogenes, &
biochemistry of cancer.
- 9) Genetic engineering: Recombinant DNA technology & its applications. Restriction
endonucleases, Plasmids, Cosmids, Gene cloning, Gene libraries.
- 10) Basics techniques in genetic engineering.
 - a) Isolation & purification of DNA, Methods of DNA assay.
 - b) Blotting techniques – Southern, Northern & Western blotting.
 - c) Polymerase chain reaction & its applications.
 - d) Ligase chain reaction & its applications.
- 11) Tumor markers & growth factors
- 12) Biotechnology: Gene therapy, Nucleic acid hybridization, and DNA probes,
Microarray of gene probes.
- 13) Genomics and Proteomics
- 14) Medical Bioinformatics
- 15) Lipid peroxidation, free radicals & antioxidants, Nitric oxide formation & its
metabolism & its role in Medicine.
- 16.) Biochemistry of AIDS
- 17.) Genetic control of Immunity
- 18.) Research Methodology & Medical ethics.

SYLLABUS FOR PRACTICALS

- 1) All undergraduate practicals and routine emergency and special investigations carried out in central clinical laboratory of the hospital, which are useful for diagnosis and prognosis of the disease.
- 2) Total Quality Management of Laboratory
 - a) Specimen collection, handling & storage of sample.
 - b) Methods of standardization & calibration.
 - c) Methods of quality control & assessment.
- 3) Fractionation & Identification of,
 - a) Amino acids b) Sugar c) Proteins d) Lipoproteins by
 - i) Thin Layer Chromatography ii) Paper chromatography (circular, Uni-dimensional & two dimensional iii) Gel electrophoresis- agarose, starch, & Polyacrylamide Gel Electrophoresis iv) paper electrophoresis & cellulose acetate paper electrophoresis .
- 4) a) Estimation of total activity of following enzymes .
 - i. LDH & separation of its isoenzymes by Polyacrylamide gel electrophoresis, Cellulose acetate electrophoresis & quantitation by densitometry.
 - ii. AST(GOT)
 - iii. ALT(GPT)
 - iv. Alkaline phosphatase
 - v. Acid phosphatase
 - vi. Amylase
 - vii. Creatine kinase its Isoenzymes
 - b) Enzyme kinetics and Determination of K_m value and effect of pH substrate concentration & temperature on Enzyme activity.
 - c) Endocrinology: Estimation of Hormones.

- 5) Isolation of DNA and PCR technique.
- 6) Estimation of serum lipid profile .
 - i) Serum total cholesterol
 - ii) Serum HDL cholesterol
 - iii) Serum VLDL & LDL
 - iv) Serum Triglycerides
 - v) Serum Phospholipids
- 7) Estimation of Fe & Total Iron Binding capacity, & ferritin
- 8) Estimation of Glycosylated Hb.
- 9) Body fluid analysis - Urine
 - CSF
 - Ascitic fluid
 - Pleural fluid
- 10) Estimation of VMA.
- 11) Estimation of Na, K & Lithium by Flame photometer.

Dissertation:

The dissertation is compulsory for candidates registered for P.G. degree & should include candidates own work under a supervisor , qualified for the purpose & recognized as a P.G. teacher by the University. The subject of dissertation along with synopsis (about 200 words) signed by P.G. teacher, H.O.D.& Head of the Institution will be submitted to the University. Ethics Committee of the Institution must approve the topic of dissertation.

Completed dissertation will be submitted to the University in the 5th term, that is, 6 month before the date of final examination.

Books recomended:

- 1) Biochemistry Ed Lubert Stryer . W.H. Freeman & company ,New york.
- 2) Principles of Biochemistry . Ed. Lehninger , Nelson & Cox .CBS publishers & distributors .
- 3) Harpers Biochemistry Ed. R.K. Murray , D.K. Granner, P.A. Mayes & V.W. Rodwell. Appleton & Lange ,Stanford, Connecticut.
- 4) Textbook of Biochemistry with clinical correlations. Ed. Thomas M. Devlin. Wiley Liss Publishers.
- 5) Genes VI Ed. Benjamin Lewin .Oxford University press.
- 6) Tietz Textbook of Clinical chemistry, Ed. Burtis & Ashwood W.B. Saunders Company.
- 7) Principles & techniques of practical Biochemistry Ed. Keith Wilson & John Walker Cambridge University press .
- 8) Biochemistry Ed. Donald Voet & Judith G. Voet John Wiley & Sons ,Inc.
- 9) Molecular cloning –A laboratory Manual .J. Sambrook , E.F. Fritsch & T. Maniatis Cold Spring Harbor Laboratory Press.
- 10) Molecular cell Biology , H. Lodish, A. Berk, S.L. Zipursky, P. Matsudaira ,D. Baltimore ,J. Darnell.
- 11) Bio-technology 1st edition . U. Satyanarayan Books & Allied Publisher (p) Ltd. Kolkatta.