

# SUMANDEEP VIDYAPEETH

(Declared as Deemed to be University under Section 3 of the UGC Act 1956)

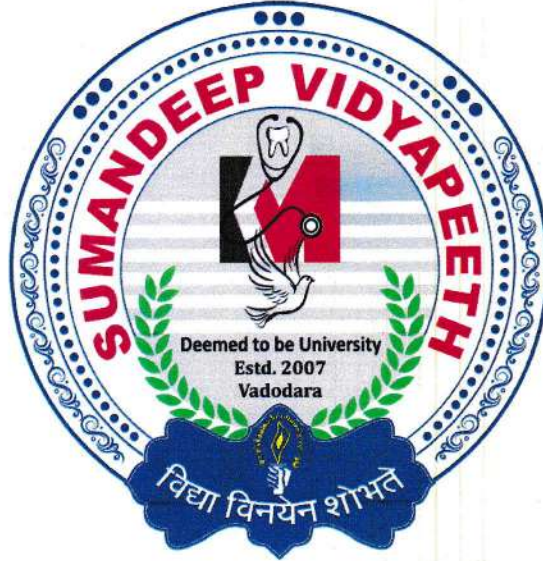
Accredited by NAAC with a CGPA of 3.53 out of four-point scale at 'A' Grade

Category – I deemed to be university under UGC Act - 2018

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## CURRICULUM

### Doctor of Medicine (M.D.) BIOCHEMISTRY

Attested CTC



*Manchanda*, *Sharaney* 15/2/2021  
Vice-Chancellor

Sumandeep Vidyapeeth  
An Institution Deemed to be University  
Vill. Piparia, Taluka: Waghodia.  
Dist. Vadodara-391 760. (Gujarat)

*Patel*



AMENDED UP TO DECEMBER -2020

### **Programme outcome : MD**

The purpose of MD education is to create specialists who would provide high quality health care and advance the cause of science through research & training. The goal of postgraduate medical education shall be to produce competent specialists and/or Medical teachers.

### **Programme specific outcome : MD**

**POS 1.** Scholars shall recognize the health needs of the community, and carry out professional obligations ethically and in keeping with the objectives of the national health policy.

**POS 2.** Scholars shall have acquired the basic skills in teaching of the medical and paramedical professionals.

**POS 3.** Practice the specialty concerned ethically and in step with the principles of primary health care.

**POS 4.** Demonstrate sufficient knowledge of the basic sciences relevant to the concerned specialty.

**POS 5.** Develop skills in using educational methods and techniques as applicable to the teaching of medical/nursing students, general physicians and paramedical health workers.

**COURSE OUTCOME (CO)::** At the end of the MD training programme in Biochemistry, the post graduate student shall acquired competencies in the following areas, as detailed below:

1. Scholars shall able to explain clearly concepts and principles of biochemistry and acquire knowledge of cell biology, including correlations of these with cellular and molecular processes involved in health and disease.
2. Scholars shall acquire basic skill to teach undergraduate students in medicine and allied health science courses so they become competent health care professionals and able to contribute to training of postgraduate post graduate students.
3. Scholars shall acquire basic skill to set up/supervise/manage a diagnostic laboratory in Biochemistry in a hospital, ensuring quality control, and providing a reliable support service.
4. The student should be able to provide clinicians with consultation services for diagnostic tests in biochemistry and in interpretation of laboratory results.
5. The student should be able to carry out a research project from planning to publication and be able to pursue academic interests and continue life-long learning to become more experienced in all the above areas and to eventually be able to guide postgraduates in their thesis work.

**Attested CTC**

*Sharaney*  
15/2/2021

**Vice-Chancellor**  
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## SYLLABUS FOR M.D. BIOCHEMISTRY

**Training in the MD(Biochemistry)** at the SBKSMI&RC, Piparia, Sumandeep Vidyapeeth is designed to prepare fellows for careers that may combine academic and clinical pursuits, including service, teaching and research.

The basic program is intended to last three years in most cases, to allow sufficient time for in-depth training in the broad area of clinical chemistry, molecular diagnostics and laboratory medicine as well as time to develop an area of research.

The first year is focused on in-depth study of laboratory medicine, with emphasis in the areas of clinical chemistry, toxicology, therapeutic drug monitoring, molecular diagnostics, biochemical genetics, laboratory computing, immunological testing, evidence-based laboratory medicine and point-of-care testing.

Additional time in hematology, coagulation and microbiology is available for fellows who wish to be prepared to direct a core laboratory.

Fellows are integrated into laboratory rotations with pathology residents and into clinical activities with residents and attending in clinical departments, notably in the Divisions of General Medicine, Endocrinology and Infectious Disease in the Department of Internal Medicine and the in the Department of Emergency Medicine.

### 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, porphyrinsglycosaminoglycan, glycoproteins.
- 5) Chemistry of blood & hemoglobin, plasma proteins,Blood coagulation.
- 6) Enzymes & coenzymes –chemistry ,nomenclature properties & mode of action ofenzymes,Enzyme kinetics, factors affecting enzyme activity,enzymeinhibitions,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)Flamephotometry, 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 andElectron - microscopy
- 14)Environmental Biochemistry – Definition, importance of pollution free & ecofriendlyenvironment, exposure to cold stress, exposure to heat, air pollution water pollution& food pollution
- 15)Immunochemistry – The Immune system, Immunoglobins, antigen –antibodymediated immunity, mononuclear phagocytes –macrophages,elements of clinicalimmunity.

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## Paper- II: METABOLISM AND NUTRITION

- 1) Digestion & absorption from gastrointestinal tract.
- 2) Intermediary metabolism, metabolism of Carbohydrates, Lipids, Proteins , and Aminoacids , 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) Errors of metabolism.
- 16) Biotransformations of Xenobiotics
- 17) Basic concepts of Biochemical Defense Mechanisms

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#### 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.

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## 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, Unidimensional & 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 Km 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) ~~Attsted, P.T.C~~ 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 months before the date of final examination.

Throughout three year afternoon session, two days per week

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Diverse teaching formats include large group lectures with team learning activities, small group (8-12 learners) discussions, smaller groups (2-3 learners) for clinical skills instruction, and one-on-one instruction.

Variety of instructional methods includes clinical problem-based cases, multistation exercises, and simulations with standardized patients, videotaping with instructor feedback, and computer-based instruction.

Topics are organized within seven threads:

- *To introduce Basic life support (BLS) and Advanced Cardiac Life Support (ACLS) training for all the First year Postgraduate Resident Doctors from academic year 2017-18. (Board of Studies letter no.: SBKSMIRC/Dean/1777(A)/2017, dated 28/11/2017 and Vide Notification of Board of Management Resolution Ref: No.: SV/8813/2017-18, dated 06/04/2018)*

**Communication:** Interviewing, history taking, psychiatric interviewing, sexual history taking, alternative medicine issues, cultural competency

**Physical Exam:** Normal surface anatomy, normal adult and child examination, gynecologic examination, geriatric examination, clinical procedural skills

**MD in Society:** Health care system, public health, bioethics, advocacy, public policy, international medicine, end of life care, domestic violence, preventive medicine

**Quantitative Medicine:** Epidemiology, information management, biostatistics, evidence-based medicine (EBM), introduction to clinical investigation, critical appraisal, exposure to scholarly concentrations

**Nutrition:** Principles of nutrition science followed by clinical applications in a series of web-based modules

**Medical Practice:** Skills training, professionalism, exposure to specialists, clinical teams, hospital information systems, clerkship mechanics

**Clinical Correlation:** Multisystem problems, development of problem lists, differential diagnoses, integration of basic science concepts .

Scholarly Concentrations, a new feature of the provide medical students with independent, creative scholarly experiences in areas of personal interest. This required component of the curriculum develops critical thinking, skills in evaluation of new data, and hands-on experience with the methods by which new scholarly information is generated.

All the post graduate Journal Clubs carried out on a prescribed Evidence Based format with emphasis on critical appraisal. A designated teacher/facilitator will assess every post graduate student for each JC presentation.

All PG seminars will have evidence embedded in the presentation and all references relating to the subject matter will be incorporated. At the end of the seminar all the references will be listed and the seminar will be assessed by the facilitator.



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