

## ANNEXURE -V

### SYLLABUS FOR EXAMINATION (Diploma Level)

#### I CLINICAL BIOCHEMISTRY

##### Unit-I. GENERAL TOPICS

- 1. Laboratory Services:-**Levels of laboratories - primary level, secondary level & tertiary level, Reference laboratories.
- 2. Infrastructure in the laboratories.** a) Laboratory space: Reception, specimen collection, quality water supply, power supply, work area, specimen /sample /slide storage, cold storage, record room, fire safety, b) Personnel in the laboratory - Qualifications as per NABL document. c) Equipment - Listing, cleaning, maintenance, SOP, verification of performance, Internal quality control. d) Instruments:- Theoretical basis, uses, different parts, installation of instruments - calorimeters, spectrophotometers, balances, centrifuges, refrigerators, hot air ovens, water baths, thermometers, vortex mixers, magnetic stirrers, UV lamp, spectroscopes. e) Reagents & Materials- Purchase, maintenance, storage and use.
- 3. Specimen collection, storage & Transport:-** a) General guidelines of sample collection, labelling, handling, transportation, storage of specimen. Care in handling specimens. Pre-analytical considerations including patient preparation. b) IP/OP Nos and LAB. Nos, worksheets, reporting test results, specimen rejection record, recording of laboratory data, maintenance of records. c) Types and mechanisms of action of various anticoagulants and preservatives used. d) Serum and plasma preparations. Preparation of Protein Free Filtrate. Sample stability.
- 4. Water, chemicals, solutions and reagents:-** a) Types of water. Characteristics and principles of preparation of distilled and deionised water - distillation apparatus and deioniser b) Chemicals - different grades of chemicals and their significance c) Solutions - definition and preparation of percent, normal, molar & molal solutions d) Concept of standard solutions - principles of preparation of standard solutions - primary & Secondary standards.

##### Unit-II

1. Units of measurement - different systems followed & their inter-conversions
2. Colorimetry - principles- complete understanding of percent transmittance, absorbance, & Beer Lambert's law. Concept of using blank, standard and test (B, S& T). Mathematical calculation of quantity of an analyte through formulation of general formula.
3. Electrochemistry:- basic principles and applications of potentiometry. Ion

selective electrodes. 4. Accidents and Emergencies & first-aid in the laboratory. 5. Bio-waste Management. 6. Automation:- basic principles, different components and general principles of usage applications 7. Ethical considerations:- transmission of ethical values, voluntariness, compliance. 8. Computers:- basic theoretical knowledge and usage of computers in clinical biochemistry laboratory. 9. Quality assurance :- Standard Operating Procedures (SOPs) - definition ,format, 10. Internal and external quality assessment –Introduction.

### **Unit-III: Biochemistry**

Chemistry of carbohydrates and reactions of glucose. Carbohydrate metabolism, glycolysis, citric acid cycle, HMP shunt, oral glucose tolerance test in normal and diabetes mellitus, Ketone bodies. Chemistry of lipids and lipoproteins, Chemistry and metabolism of proteins –ammonia metabolism, urea cycle, Chemistry of nucleic acids- Structure of DNA, RNA, ATP, GTP, UTP., Non protein nitrogen substances (NPN) - urea, Creatinine, uric acid., Digestion and absorption of carbohydrates, lipids and proteins, Vitamins and minerals

### **Unit-IV: Clinical Biochemistry**

1. Acids, bases & salts:- Concepts of hydrogen ion concentration. pH & pH meter. 2. Plasma proteins - fractionation techniques, interpretation. 3. Bilirubin :- Outlines of formation and excretion. Conjugated and unconjugated bilirubin and its clinical applications. Jaundice. 4. Urine:- Formation and characteristics of normal urine. Abnormal constituents. Urine analysis and interpretation. Spot urinary protein, 24 hours urinary protein. 5. Renal clearance tests ; & Total Protein & A:G ratio, Blood urea, S. Creatinine, BUN. 6. Body fluids:- Outlines of formation, composition and analysis of bodyfluids like cerebrospinal fluid, pleural fluid, & peritoneal fluid and interpretation of the results. 7. Glucose tolerance test :- Concepts of tolerance tests. Definition, patient preparation, performance, reporting and interpretation of GTT. 8. Blood coagulation:- basic knowledge. Principles of estimation of plasma fibrinogen and prothrombin time, APTT. 9. Lipids & Lipoproteins:- triglycerides, cholesterol, phospholipids. Serum lipoprotein - patterns in health and disease. 10. Enzymes& Isoenzymes - LDH, CPK, GGT,SGOT, SGPT 11. Hormones - analysis of 17-keto steroids and VMA. 17. Inorganics:- Concepts; - Bicarbonates, phosphates, calcium, sodium, Potassium, 18. Blood gases Analysis:- Bicarbonate buffering system, Henderson-Hasselbach reaction, blood pH, pO<sub>2</sub>, pCO<sub>2</sub>, HCO<sub>3</sub><sup>-</sup> calculations; nomograms

### **Unit-V: Demonstration topics**

a) liver function tests b) gastric analysis c) Renal function tests d) Radio-isotopic techniques e) Calculi formation and analysis f) Thyroid function tests g) Electrophoresis.

## II. CLINICAL MICROBIOLOGY

### Unit-I: General microbiology

Knowledge of various samples and procedures of collection for microscopy, serology & culture; Procedures of accepting/rejecting samples for cultures; Procedures of labeling, registering, transport & storage of various specimens; Procedures of laboratory work- safety and laboratory maintenance- Knowledge and expertise in working under conditions of biological hazard (BSL 1, 2, 3); Procedure of handling exposure to various infectious agents; Biomedical waste management; Maintenance of laboratory equipment; Culture methods for different bacteria & fungi – Media preparation; Methods of inoculation; Disposal of used media & specimens; Sterilization & Disinfection- Laboratory; Operation theatres.

### Unit-II: Bacteriology

Characterization of aerobic and anaerobic bacteria - Differences between aerobic and anaerobic; Gram's staining method-Reagents preparation; Alberts stainig-Reagents preparation; AFB staining-Reagents preparation; Characterization of Gram positive bacteria-cocci-Staphylococcus & streptococcus-bacilli-Mycobacteria, Clostridia & Corynebacterium; Gram negative bacteria-E.coli, Klebsiella, Proteus, Salmonella, Shigella, Vibrio, Pseudomonas; Principles of bacterial identification-staining, culture, spot tests, Commercial kits.

### Unit-III: Mycology & Parasitology

Knowledge of common pathogenic fungi-differences between yeasts and moulds; Fungal media preparation, pH adjustment, preservation of media & samples, preparation of reagents-KOH, germ tube test, spot tests.

Knowledge of various parasites and diseases caused by them; life cycles, morphology, hosts, vector, animal reservoir, epidemiology, parasite - host relationships, diagnosis and treatment – E.hystolytica, Giardia, Cryptosporidium, Ascaris, Echinococcosis, Schistosoma, Toxoplasma; Blood parasites – plasmodium, microfilaria; Light microscopy, reagent preparation, staining methods; Normal saline & Lugol iodine mounts ; Serological methods for parasite detection, identification of antigens in blood, feces and urine.

### Unit-IV: Virology

Knowledge of medically important viruses; General laboratory tests for viral detection; Viral serology & ELISA; Tests based on Immunochromatography; Maintenance of viral laboratory.

### Unit-V: Automation in Microbial Identification

Automation in bacteriology-Blood culture systems; Methods of antimicrobial sensitivity tests- Disk Diffusion Test (Kirby Bauer) – MIC- E test; Principle of action of

antibiotic agents; Detection of multi drug resistant (MDR) bacteria- ESBL, MRSA, VRE, Mycobacterium; Serological tests for antigen & antibody detection.

### **III. PATHOLOGY**

#### **Unit-I: Clinical Pathology**

Urine collection, physical & chemical examination; Sugars, proteins, ketone bodies, Bence-Jones proteins, bile, blood in urine; Microscopic examination – formed elements; Casts, crystals, parasites, abnormal cells; Other body fluids- types, names, physical & chemical examination; Semen analysis- physical, chemical and microscopic examination.

#### **Unit-II: Heamatology**

Knowledge about RBCs, WBC, platelets and any abnormal cells; Haemoglobin estimation, red cell indices, haematocrit, ESR; Total cell counts- WBC, RBC, platelets, AEC; LE cell test  
Coagulation related tests; Haemoparasites, bone marrow slide preparation; Cell coulter operation.

#### **Unit-III: Histopathology**

Knowledge of material and equipment used; Collection, preservation and labeling of samples; Grossing methods, fixatives used and processing of tissue including bone tissue from collection to slide making; Special stains and immunohistochemistry; Staining procedures; Preservation of specimen, blocks, reports; Mounting of museum specimens.

#### **Unit-IV: Cytology and General Pathology**

Different types of techniques and equipment used to obtain materials including various guided; methods- FNAC, imprint smear. Vaginal smear, buccal smear, cytospin cytosmears; Various staining methods, Different reagents used in Pathology; Preparation of fluids for cytological examination; Transport of specimen Preservation of samples., reports, records.  
Disposal of waste (infected materials)

#### **Unit-V: Immuno haematology**

Material and methods used in Blood banking; Blood grouping techniques, ABO system and Rh system; Donor's selection; Storage and processing of blood bags; Blood bags- grouping, quality control test and labeling; Direct and indirect coombs test, antibody titers; Problems in blood grouping and cross matching.