



PUNJAB PUBLIC SERVICE COMMISSION

BARADARI GARDENS, PATIALA-147001

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SYLLABUS OF LECTURER IN MEDICAL LAB TECHNOLOGY IN THE DEPARTMENT OF TECHNICAL EDUCATION AND INDUSTRIAL TRAINING PUNJAB

Section-A (30 Questions)

General Studies

1. General awareness about India and State of Punjab with particular reference to Geography and History of India and Punjab, Constitution of India and Salient features of Indian Economy.
2. Current events of National and International importance.
3. Basic Concepts of Ecology, Environment and Science and Technology.

Section-B (70 Questions)

I--ANATOMY AND PHYSIOLOGY

- 1) Introduction to human body, its anatomy and physiological organization
- 2) Cell organization and function
- 3) Skeletal system- bones, joints and muscles
- 4) Blood morphology, chemistry and function--- Blood cells, Blood groups, Hb
- 5) Respiratory system---- Lungs Volumes and capacities
- 6) Cardiovascular system --- Heart rate, cardiac cycle, blood pressure, Hypertension
- 7) Alimentary system ---- mechanism and physiology of digestion and absorption.
- 8) Excretion system--- Structure of nephron, Urine formation

- 9) Male and female genital system
- 10) Central Nervous System---- Sensory, Sympathetic & Parasympathetic
- 11) Endocrine Glands & Hormones--- Their secretion and functions
- 12) Skin - Function & Structure
- 13) Special Senses – Eye, Ear and Nose (in brief)

II--CLINICAL MICROBIOLOGY

- 1) Introduction & brief history--- definition, history (Louis Pasteur, Robert Koch, Joseph Lister, Paul Ehrlich), Safety measures in Microbiology
- 2) Care and maintenance of laboratory equipments (including glassware)
- 3) Principles, functioning, care of microscopes i.e. Monocular/Binocular microscope, Dark ground microscope, Phase contrast microscope, Fluorescent microscope and Electron microscopes.
- 4) Sterilization and Disinfection—principles - Physical & Chemical Agents, Antiseptics and Disinfectants
- 5) Growth and Maintenance of Microbes-- Bacterial division, Bacterial growth & nutrition
- 6) Culture Media--Definition, uses, classification, Transport Media, Anaerobic Media,
- 7) Staining Methods-- Principles of staining methods --Simple, Grams, ZN, AFB, Negative .
- 8) Collection and Transportation --- Principles, Containers, Samples- Urine, Faeces, Sputum, Pus, Body fluids, Swab, Blood.
- 9) Disposal of Laboratory/Hospital Waste-- Non-infectious, Infected sharp and non-sharp waste disposal, Disposal of contaminated material.
- 10) General Characteristics and classification of Bacteria-- Morphology- Shape, Capsule, Flagella, Spore. Motility test .
- 11) Morphology, culture characteristics, biochemical reactions, pathogenicity, lab diagnosis and anti microbial sensitivity testing of –Staphylococci, Streptococcus, Neisseria, Corynebacterium, Mycobacterium, Enterobacteriaceae family, Pseudomonas, Vibrio, Bacilli & Clostridium, non sporing anaerobes, Spirochaetes, Mycoplasma.
- 12) Medical parasitology-- Introduction, Collection, preservation and processing of –stool,

blood, fluids.

- 13) General characters & classification of protozoa and helminths.
- 14) Morphology, lifecycle, pathogenicity and lab, diagnosis of – Entamoeba histolytica, Giardia intestinalis, Plasmodium, Ascaris, Ancylostoma
- 15) Mycology-- Morphology, Classification & Cultivation of fungus, Lab diagnosis of Cutaneous, Sub- cutaneous and Systemic Mycosis (in brief), Opportunistic fungal infections, Common Laboratory Contaminants.
- 16) Immunology & Serology—Immunity, Principles of Innate & Acquired immunity, Immune Response- Humoral & cell mediated, Antigen-- Definition, Types, properties, Antibodies/Immunoglobulins- Definition, Properties, Sub types.
- 17) Features of Antigen-Antibody Reactions—Precipitation, Agglutination, Complement fixation test, Neutralization, Flocculation, Hyper sensitivity - Auto immune disorders
- 18) Medical Virology-- Introduction, Nomenclature , Classification of viruses
- 19) General properties of viruses including Size, shape, symmetry, Cultivation of viruses and antiviral agents, Brief Knowledge about- Rabies, Polio virus, Pox viruses, Hepatitis Viruses, HIV, Arbo viruses (dengue), Influenza
- 20) Preservation of microbes and Iyophilisation methods, Total and viable counts of Bacteria, Testing of disinfectants-Rideal-Walker, Chick-Martin and In-use tests
- 21) Nosocomial infection, Bacteriological examination of water, milk and air
- 22) Lab Diagnosis of common bacterial infection viz:

Pyogenic infections, Respiratory tract infections, Meningitis, Diphtheria, whooping cough, Food-poisoning, Enteric fever, Urinary tract infection, Leprosy, Typhus fever, Syphilis, Gonorrhoea and other STD's.
- 23) Serological tests:- Widal, ASO, LFT, CRP, Rosewaller, VDRL
- 24) Automation in Microbiology, Advanced techniques in microbiology-ELISA, RIA, CCIEP, Co-agglutination , GLC, HPLC etc.,

III—HAEMATOLOGY AND BLOOD BANKING

- 1) Introduction , Lab safety and instrumentation
- 2) Composition and functions of blood and formation
- 3) Anticoagulants, their uses, mode of action
- 4) Physiological variations in Hb, PCV, TLC, MCV, MCH, MCHC and platelets
(Normal and absolute values in haematology.)
- 5) Hemoglobinometry- methods of estimation, errors involved and standardization of instruments.
- 6) Haemocytometry- procedures for cell counts, visual as well as electronic, red cell, leucocytes and platelet counts. Errors involved and mean to minimize such errors.
- 7) Romanovsky dyes, preparation and staining procedures of blood smears.
- 8) Morphology of normal blood cells and their identifications.
- 9) ESR-factors influencing ESR, procedures for estimation & their significance.
- 10) Hematocrit value by macro and micro methods their merits and demerits.
- 11) Physical, chemical and Microscopic Examination of urine
- 12) ABO and Rhesus blood group system, Principal of Blood grouping, Blood grouping techniques,
- 13) Compatibility tests in blood transfusion, Lab investigations of transfusion reactions and mismatched transfusions, prep of packed cells and various fractions of blood for transfusion purpose.
- 14) Hemoglobin- synthesis, functions and degradation, LE cell phenomenon, Foetal haemoglobin, Plasma Haemoglobin
- 15) Anaemias - Definition and classification , Laboratory investigation for megaloblastic anaemia, iron deficiency anaemia and haemolytic anaemia
Leukemia: definition and classification, Haemopoietic disorders: Stainings
- 16) Hemostasis - Definition, Basic concept and principle

- 17) Coagulation -Basic Physiology, coagulation factors, Regulators of blood coagulation, Bleeding Time- Duke's method, Clotting Time- Capillary tube method & Lee white's method, PT, aPTT, TT, Clot retraction time, Determination of fibrinogen.
- 18) Bleeding disorders-Platelet disorder(Platelet function tests) - Thrombocytopenias causes including aplastic anemia, -D I C(Laboratory test for assessing bleeding disorders and disseminated intravascular coagulation), ITP,- Hemophilia
- 19) Mechanism of fibrinolysis- tests for fibrinolysis
- 20) Screening donor's blood for infectious agents - HIV, HCV, HBV, Treponema palladium, Plasmodium and bacterially contaminated Blood

IV—HISTOPATHOLOGY AND CYTOLOGY

- 1) Terminology-Histology, Histopathology, Biopsy, Autopsy, Autolysis, Putrefaction
- 2) Compound microscope-optical system, magnification and maintenance.
- 3) Reception, recording, labeling and preservation of histological specimen
- 4) Fixation- Fixatives- classification & their Composition
- 5) Preparation of Tissue-- Paraffin embedding and embedding media.
- 6) Decalcification- Process, Types, mechanism & advantage
- 7) Microtomy—Microtome types - Working principle, care and maintenance
- 8) Microtome Knives- types, Sharpening of knives (Honing - Stropping) Automatic knife sharpener – uses, care and maintenance, Use of abrasives and lubricants
- 9) Section Cutting- Rough& Fine, cutting faults and remedies, Tissue floatation bath,
- 10) Theory of staining (Routine), Mountants and types of mounting media
- 11) Dye Chemistry- Principle and mechanism of routine stain (Haematoxylin and Eosin)
Various steps of staining (Haematoxylin and Eosin)- Deparaffinization, Hydration, Nuclear Staining, Differentiation, Blueing, Counterstaining, Dehydration, Clearing and Mounting, Results

- 12) Definition- Solvents, Mordants, Accelerators, Metachromasia(brief),Use of controls in staining and their significance
- 13) Frozen Section- Reception and processing of frozen tissue, Freezing microtome & cryostat- Working, care & Frozen section cutting
- 14) Microscopy- working principle, maintenance and applications of various types of microscopes-- Dark ground microscope., Polarizing microscope,Phase contrast microscope, Interference microscope, U.V. light microscope. Micrometry.
- 15) Principle, significance and interpretation of stains-- PAS, Silver impregnation stain – Reticulin fibre, ZN – for AFB and Leprae, Masson’s trichrome stain, Pearl’s Prussian Blue – Iron, Oil Red O – fat, Gm stain.
- 16) Exfoliative Cytology – Introduction, Preparation of vaginal & cervical smears,
- 17) Fixation (Cytological Specimen) – Definition, Various types of Cytological fixatives
Cytological special stains Principle, procedure & Interpretation of- PAS& ZN Stain
- 18) Aspiration Cytology - Principle & Uses of FNAC (Fine Needle Aspiration Cytology),
Staining Techniques-MGG, PAP Stain, H&E Stain
- 19) Museum Techniques- Introduction to museum- Reception, fixation and processing of various museum specimens, Preparation of mounting solutions, Technique and Care of mounted specimen, cataloguing of museum specimen
- 20) Autopsy -Introduction to autopsy technique and its use

V—CLINICAL BIOCHEMISTRY

- 1) Introduction to biochemistry – Definition & Importance, SI Units and their use
- 2) Volumetric apparatus and their calibration
- 3) Cleaning of laboratory glass and plastic ware - Different cleaning agents (soaps, detergents, chromic acid)
- 4) Important instruments- principle, working, handling and care of - Balance (Analytical, electrical/electronic), Centrifuge, Colorimeter, Spectrophotometer, Ion selective electrodes, Glucometer, Flame photometer, pH meter
- 5) Anticoagulants – Definition, Types, Uses, Merits and Demerits

- 6) Blood fractions - Preparation of Serum and Plasma, Different protein precipitating Reagents, Preparation of protein free filtrate (PFF)
- 7) Collection and preservation of clinical specimens – Blood, Urine, Stool, Other Body Fluids
- 8) Blood glucose/ sugar estimation, screening test and glucose tolerance test (GTT)
-Reference values, True and apparent sugar, Renal threshold, Importance of ST/GTT
Clinical importance of blood sugar, ST/GTT
- 9) Blood urea -Formation and excretion of urea, Principle and procedures of different methods of urea estimation, Reference values, Clinical Importance
- 10) Serum Creatinine - Principle and procedure of various estimation methods, Reference values, Clinical importance
- 11) Serum proteins- Definition and types, Principle and procedure of various estimation methods, Reference values, Clinical importance
- 12) Electrolytes and trace elements- Functions of electrolytes (Na⁺, K⁺, Cl⁻, P, Ca²⁺, Fe²⁺) their metabolism, Principles and procedures of estimation of Na⁺, K⁺, Cl⁻, Reference values, Clinical importance.
- 13) Uric Acid- Principles and procedures various estimation methods, Reference values, Clinical Importance
- 14) Serum Bilirubin - Formation and excretion of bilirubin and bile pigments, conjugated and unconjugated bilirubin, Principle and procedures of serum bilirubin estimation (Direct & Indirect), Reference values, Clinical importance
- 15) Urinary Proteins and Creatinine - urinary proteins and creatinine estimation, Reference Values, Clinical importance
- 16) SGOT and SGPT- Principle and procedures of estimation, Reference values, Clinical importance
- 17) ALP and ACP- Principle and procedures of estimation, Reference values, Clinical importance
- 18) Serum Amylase - Principle and procedures of estimation, Reference values, Clinical

importance

- 19) Renal Function Tests - Renal clearance test-Principle and procedures, Clinical importance
- 20) Serum Calcium and Phosphorus -Principle and procedures of estimation, Reference Values, Clinical importance.
- 21) Lipid Profile - Formation of cholesterol, HDL and LDL cholesterol, Principles and procedures of estimation, Reference value, Clinical importance, Triglycerides, Estimation and importance of various ratios of HDL, LDL and VLDL
- 22) Urine Analysis- Normal composition of urine, Clinical importance of urine analysis, Qualitative analysis of proteins, sugar, bile salts, bile pigments, urobilinogen and Blood, Glycosuria and Albuminuria, Ketone bodies, 17 Ketosteroids
- 23) Stool Chemistry- Physical characteristics and chemical composition of stool, Significance of presence of blood and excess fat in stool, Occult blood detection
- 24) Cerebrospinal Fluid- Composition and functions of CSF, Methods of determination of proteins, sugar and chloride in CSF, Reference Values, Clinical importance
- 25) Biological fluids- composition and significance of biological fluids (peritoneal, pleural, synovial, ascitic fluid and gastric juice)
- 26) Electrophoresis-Theory, Principle and procedure of paper, gel electrophoresis, method of elution, Clinical importance
- 27) Chromatography- Theory of Chromatography, separation between stationary and Mobile phases, Principle and procedure of Paper chromatography & Importance
- 28) Thyroid function tests- Functions of thyroid, Principle, reference values and clinical Importance of T3, T4 and TSH
- 29) Quality Assurance in Biochemistry as per National Standards
- 30) Automation in Biochemistry- Introduction, meaning, advantages, Auto analyzers - basic features, types, semi automated, fully automated, RIA and ELISA.

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Sd/-
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