

प्रदेश लोक सेवा आयोग

मधेश प्रदेश

स्वास्थ्य सेवा, मे.ल्या.टे./प्याथोलोजी समुह, जनरल प्याथोलोजी /हिस्टोप्याथोलोजी /माइक्रोबायोलोजी (बैक्टेरीयोलोजी)/हिमैटोलोजी/बायोकेमेस्ट्री/जनरल मे.ल्या.टे/मेडिकल माइक्रोबायोलोजी उपसमूह
एघारौं(११) तह, पदको खुला, समावेशी र अन्तरसेवा प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

Paper II: Technical Subject

Group-A:

20%

1. Hematology

- 1.1 Explain the normal hemopoiesis.
- 1.2 Describe the structure, function, synthesis and metabolism of hemoglobin.
- 1.3 Describe the mechanism of Hb-pathies and their laboratory diagnosis
- 1.4 Classification and etiopathogenesis of different types of anemias and Leukemia
- 1.5 Hematological tests and their Principle and interpretation of:
 - 1.5.1 Reticulocyte count, reticulocyte production index
 - 1.5.2 Sickling test, HbS solubility test
 - 1.5.3 Osmotic fragility test
 - 1.5.4 Ham's test, sucrose lysis test
 - 1.5.5 Electrophoresis –HbF & HbA₂ estimation
 - 1.5.6 Demonstration of HbH
 - 1.5.7 Test for G6PD deficiency
 - 1.5.8 Coagulation disorder tests
 - 1.5.9 Platelet function test,
 - 1.5.10 Mixing study, Factor VIII and IX assay, urea solubility test, fibrinogen assay, FactorVIII inhibitor study, Test for D dimer
 - 1.5.11 Antithrombin III, protein C and protein S assay
 - 1.5.12 Serum Vitamin B12,serum folate, red cell folate estimation
 - 1.5.13 Iron and reticulin stains in bone marrow
 - 1.5.14 Fetal hemoglobin

2 Blood Banking

- 2.1 History of transfusion medicine
- 2.2 Blood collection , management and hemovigilance
- 2.3 Preservation of donated blood, mechanism of action and composition of blood preservation solution and additive solutions, changes during storage
- 2.4 Blood components: indications, preparation, storage, transport and clinical uses
- 2.5 Blood groups and its types, compatibility testing, methods of identification in laboratory and clinical significance.
- 2.6 Coomb's test: application, procedure, Rh antibody titre
- 2.7 Antibody screening and identification
- 2.8 Diagnosis of transfusion transmissible infections
- 2.9 Hema-pheresis
- 2.10 Blood transfusion reactions: laboratory diagnosis

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3 Immunohematology

- 3.1 History of immunology, types of immunity, mechanisms of immunity and evolution of immunity
- 3.2 Immunoglobulin: structure and function; regulation of immune response
- 3.3 Hypersensitivity reactions and their types, mechanism, examples
- 3.4 Cytokines and complement system and their roles
- 3.5 Auto immune diseases: mechanism and common autoimmune diseases, principle and procedure for test for autoimmune diseases
- 3.7 Major histocompatibility complex, their types, genetics, testing, role of MHC in organ transplant, MHC association with diseases, principle of transplantation, graft rejection
- 3.8 Immunological methods and application in clinical laboratories:
Double diffusion in agar, Single radial immune diffusion, Electrophoresis and immune electrophoresis, Chromatography, Ion exchange, Affinity (gel), RIA, Elisa, Western blotting, Detection of immune complexes, Immuno-flouresence, Agglutination test direct and indirect, Hemagglutination and hemagglutination inhibition, Complement assays-CFT, Detection of cellular immunity-delayed hypersensitivity skin test, Assays for lymphocytes-T and B cells, Flowcytometry, Mixed lymphocyte culture, NK cells neutrophil function test and histocompatibility testing for organ transplant.

Group-B:

20%

1. Histopathology

- 1.1. Organization of histology laboratory
- 1.2. Normal and pathological changes in tissues and organs in gastrointestinal, cardiovascular, respiratory, renal, reproductive, musculoskeletal, skin, eye, ENT, endocrine, neuromuscular and central nervous systems.
- 1.3. Mechanism of autophagy, Necrosis and apoptosis
- 1.1. Nomenclature of tumors
- 1.2. Various histological equipments, their uses and care
- 1.3. Reception and recording of tissue specimen
- 1.4. Preservation and transport of specimens and slides
- 1.5. Explain different types and functions of fixatives and methods of fixation in histopathology laboratory.
- 1.4 Decalcification of bones and calcified tissues.
- 1.5. Explain different types of chemicals, and equipment used in tissue processing and perform the procedure.
- 1.6 Explain the principle and technique of microtomy
- 1.7 Explain the embedding media and technique

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- 1.8 Explain the steps and principles of routine H&E staining and special staining techniques and mounting them.
- 1.9. Frozen Section
 - 1.9.1. Describe the principle and function of cryostat.
 - 1.9.2. Perform frozen section of intraoperative specimens and diagnose.
- 1.10 Museum technique, preparation, setting up and arrangement of museum
- 1.11 Immunohistochemistry: principle, procedure, uses, quality control, immunohistochemical markers of malignant neoplasms
- 1.12 Enzyme histochemistry: principle, reagent and specimen preparation, procedure and application

2. Cytopathology

- 2.1. Describe the normal and pathological cell morphology in vaginal, cervical and endometrial specimens and sputum specimen.
- 2.2. Perform fine needle aspiration biopsy procedure, prepare wet and dry smears fix and stain the slides with Pap stain and Giemsa stain.
- 2.3. Explain the principle of Pap stain and Giemsa stain.
- 2.4. Interpret the cellular morphological changes in sputum, vaginal, cervical and endometrial specimen and diagnose neoplastic and inflammatory conditions.
- 2.5. Describe the normal cell morphology in brushing, washing and body fluids smears.
- 2.6. Interpret the cellular morphological changes in brushing, washing and body fluid smears in different inflammatory, non-inflammatory, non-neoplastic and neoplastic conditions.
- 2.7. Explain sex chromatin. Describe the methods of obtaining and preparation of smears for the examination of sex chromatin.
- 2.8. Describe the congenital anomalies in relation to sex chromosome.
- 2.9. Interpret FNAC smears and diagnose the lesions.
- 2.10 Bone-marrow aspiration/Biopsy techniques and interpretation.
- 2.11 Principle, method and use of insitu hybridization
- 2.12 Explain cyto preparatory technique including Liquid based cytology
- 2.13 Describe different types of fixatives and methods of fixation used in cytopathological laboratory and explain their functions.

3. Clinical pathology:

- 3.1 Describe the normal and pathological changes in CSF, pleural, pericardial, synovial, Sputum, vaginal, endometrial specimen
- 3.2 Collection, transport, preservation and processing of various clinical specimens
- 3.3 Urine examination- physical, chemical and microscopic, by Strip method, automated urine analysis
- 3.4 Pregnancy test and interpretation
- 3.5 Semen examination - routine and special tests

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3.6 Sputum examination: collection, processing, physical examination, microscopic examination using various stains

3.7 Examination of body fluids

Group-C:

20%

1. Biochemistry

1.1 Structure and function of cells

1.2 Principle of Biochemistry

1.2.1 Buffer: definition, types, composition of buffer present in body fluids

1.2.2 Automation in biochemistry; wet and dry chemistry analyzer

1.2.3 Principles and applications of: Photometry, Spectrophotometry (UV, visible, IR), Fluorimetry, spectroscopy, turbidimetry, nephelometry, spectrofluorimetry, atomic emission, reflectometry, mass spectrometry, nuclear magnetic resonance, dry and wet chemistry analyzer, CLIA

1.2.4 Collection, handling and storage of sample, influence of temperature, nutrition, drugs, posture

1.2.5 Separation techniques including various chromatography techniques and electrophoresis

1.2.6 Use of radioisotopes in biochemical analysis

1.3 Chemistry of Amino acids, proteins, lipids and carbohydrates

1.3.1 Structure, function and metabolism

1.3.2 Biochemical basis, investigation and interpretation of metabolism disorder

1.4 Liver Function Test

1.4.1 Hemoglobin and bilirubin metabolism

1.4.2 Liver function test: principle, procedures and interpretations

1.4.3 Biochemical investigation in acute and chronic liver disease

1.4.4 Biochemical basis of derangement in liver function test in various diseases

1.4.5 Important plasma proteins and their laboratory estimation

1.5 Kidney Function Test

1.5.1 Renal function test: principle, procedure and interpretation

1.5.2 Biochemical investigation in acute and kidney disease

1.5.3 Proteinuria, acute and chronic renal insufficiency, concept of nephritic syndrome & nephritic syndrome

1.5.4 Glomerular filtration rate and clearance

1.5.5 Estimation of GFR and creatinine clearance

1.5.6 Activity and effects of diuretics on different laboratory tests

1.5.7 Recent advances in diagnosis of renal diseases

1.5.8 Urine analysis for different diseases, methods used, interpretation

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1.6 pH Acid Base Balance

- 1.6.1 Concept of pH and buffers. Handerson-Hasselbalch equation
- 1.6.2 Acid base regulation and its disorders, assessment of acid base status
- 1.6.3 Pathophysiology of Fluid and electrolyte balance and imbalance
- 1.6.4 Measurement of electrolytes by various methods
- 1.6.5 Blood gas analysis and interpretation

1.7 Pancreatic Function Test

- 1.7.1 Pancreatic function test, their list and clinical significance

1.8 Cardiac Function Test

- 1.8.1 Biochemical basis, investigation & interpretation of myocardial infarction
- 1.8.2 Estimation and interpretation of LDH, CPK, GOT, Troponin, CPK MB

1.9 Endocrinology

- 1.9.1 Formation, regulation, function and laboratory estimation of various clinically important hormones, effect of hypo and hyper function
- 1.9.2 Biochemical investigation of endocrine disorders
- 1.9.3 Metabolism, clinical features and laboratory investigation of excess and deficiency of calcium, phosphate and magnesium
- 1.9.4 Hormones of pancreas and gastrointestinal tract, their formation, uses, excess and deficiency states and relevant laboratory tests
- 1.9.5 Principle and procedure of estimation of various hormones in infertility
- 1.9.6 Clinical use of hormone for differential diagnosis of various diseases

1.10. Drugs

- 1.10.1 Monitoring therapeutic levels of drugs
- 1.10.2 Individual determinations for important drugs
- 1.10.3 Drug abuse and modalities of DAU testing

1.11. Enzymes: Definition, classification and properties of enzyme, regulation of enzymatic activity, Method of estimation of clinically important enzymes

1.12. Vitamins, Minerals, Nutrition

- 1.12.1 Chemistry, source, requirements, absorption, metabolism, biochemical role, excess and deficiency manifestations of various vitamins and minerals, Lab. estimation of the clinically important vitamins and minerals

Group-D:

20%

1. Microbiology

1.1 General microbiology

- 1.1.1 History and introduction of Microbiology
- 1.1.2 Pathogenesis of bacterial infection
- 1.1.3 Normal flora of skin, mouth, respiratory tract, intestine, urethra, vagina and conjunctiva

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- 1.1.4 Preparation and storage of culture media
- 1.1.5 Mechanism of action of antimicrobial drugs
- 1.1.6 Nosocomial infections: Epidemiology, different bacterial and viral infections, surveillance and control programmes, role of microbiology lab in prevention and control, device associated intravascular infections, control of nosocomial infections
- 1.1.7 Quality control in procedure, culture media, equipments
- 1.1.8 Outbreak investigation of epidemic diseases
- 1.2 Systemic microbiology
 - 1.2.1 Pathogenesis, epidemiology, transmission and laboratory diagnosis of different microbial infection of respiratory tract, genitor-urinary tract, central nervous system, gastrointestinal tract, skin, ear and eye
- 1.3 Bacteriology
 - 1.3.1 Properties, epidemiology, morphology, methods of isolation, differentiation, pathogenesis, staining property, cultural characteristics, biochemical reaction, laboratory diagnosis of Gram-positive and Gram-negative organisms, acid fast bacilli, spirochetes and miscellaneous fastidious organisms like *Mycoplasma*, *Chlamydia*, *Rickettsia*
 - 1.3.2 Bacteriological examination of water, milk, food, air and pharmaceutical products
 - 1.3.3 Collection, transport and processing of different specimens for microbiological examination
 - 1.3.4 Organisms encountered in CSF, blood culture, sputum, pus, urine, stool, body fluid aspirate and methods of isolation of such organisms
 - 1.3.5 Pathogenesis, lab diagnosis, prevention and control of emerging bacterial infections
 - 1.3.6 Aerobic and anaerobic culture, identification, antibiotic sensitivity and their profiling
- 1.4 Virology
 - 1.4.1 General features and types of viruses.
 - 1.4.2 Pathogenesis of viral carcinogens.
 - 1.4.3 Pathogenesis, lab diagnosis, prevention and control of emerging viral infections
 - 1.4.4 Properties, pathogenesis and diagnosis of the medically important virus
 - 1.4.5 Laboratory procedures for isolation of virus
- 1.5 Mycology
 - 1.5.1 General properties and classification of fungi
 - 1.5.2 Morphology, pathogenesis and diagnostic laboratory tests for superficial, deep and systemic mycosis

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1.5.3 Laboratory procedure for identification of fungal pathogens in clinical specimens

1.6 Parasitology

1.6.1 Study of morphology, life cycle, developmental stages, symptoms, pathogenesis, epidemiology, diagnosis, and prevention of medically important parasites

1.6.2 Demonstration of parasites in clinical specimens (Urine, Stool and Other) including methods of sample collection and preparation.

Group-E:

20%

1. Medical statistics and information technology

- 1.1 Statistical methods in Laboratory (mean, median, mode, standard deviation, standard error, sampling methods, types of data, probability, variables, correlation, regression statistical significance test)
- 1.2 Familiarity with the use of the computer and other telecommunication devices like the fax for the storage, retrieval and sending of information.
- 1.3 Laboratory Information System (LIS).

2. Human molecular genetics

- 2.1 Fundamentals of central dogma (DNA, RNA and proteins; mutations), Chromosome structure and function (organization; structure-function relationship; chromosome abnormalities).
- 2.2 Genes in pedigree (Mendelian pedigree patterns, complications to pedigree patterns), DNA cloning and hybridization techniques (vector based cloning; nuclei acid hybridizations; PCR-based DNA analyses)
- 2.3 Mutation and instability of human DNA (mutation and polymorphism; pathogenic mutations, repeat expansions), Molecular pathology (types of mutations; animal models for human disease)
- 2.4 Identifying human disease genes (functional cloning versus positional cloning; mutation screening), Complex diseases; The Human Genome projects.

3. Total Quality Management, quality assurance and Laboratory accreditation

- 3.1 Quality assessment of samples, preservation, transportation, preparation, testing
- 3.2 Quality assessment of reagent, kits and calibration of equipments
- 3.3 Quality assessment of methods of testing and reporting
- 3.4 Total quality management system in Laboratory medicine
- 3.5 Medical laboratory accreditation: importance, requirements, initiation, documentation, processing for laboratory accreditation

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4. Research Methodology and scientific writing

- 4.1 Introduction, objective of research, definition, types of research, steps in research process, criteria of good research; ethics in research. research formulation and literature review, bibliography and references
- 4.2 Data collection: source of data, primary and secondary data, collection methods, data processing and analysis
- 4.3 Components of scientific research paper

5. Laboratory hazards, safety precaution and laboratory waste management

- 5.1 Bio-safety levels and bio-safety guidelines, bio-security, Hazards in medical laboratory and safety precautions.
- 5.2 Different ways of sterilization
- 5.3 Different methods of waste management in medical Laboratory

6. Recent advances in laboratory medicine

- 6.1 Automation in Medical Laboratory
- 6.2 Stem cell processing and storage for transplantation,
- 6.3 Tumor markers and
- 6.4 DNA microarray,
- 6.5 MALDI-ToF,
- 6.6 Flowcytometry,
- 6.7 POCT,
- 6.8 Automated blood culture system and automated microbial culture and antibiotic sensitivity testing,
- 6.9 maintenance of laboratory equipments,