

प्रदेश लोक सेवा आयोग

गण्डकी प्रदेश

स्वास्थ्य सेवा, मे.ल्या.टे./प्याथोलोजी समूह, एघारौं (११) तहको खुला र आन्तरिक
प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

Paper II: Technical Subject

Group A

50%

1. Hematology

- 1.1 Explain the normal hemopoiesis.
- 1.2. Describe the structure, function, synthesis and metabolism of hemoglobin.
- 1.3 Classification and etiopathogenesis of different types of anemias
- 1.4 Hematological tests and their Principle and interpretation of:
 - 1.4.1 Reticulocyte count, reticulocyte production index
 - 1.4.2 Sickling test, HbS solubility test
 - 1.4.3 Osmotic fragility test
 - 1.4.4 Coomb's test
 - 1.4.5 Kleihauer acid Elution test, Alkali denaturation test
 - 1.4.6 Ham's test, sucrose lysis test
 - 1.4.7 Electrophoresis – HbF & HbA₂ estimation
 - 1.4.8 Demonstration of HbH
 - 1.4.9 Test for G6PD deficiency
 - 1.4.10 BT, CT, PT, APTT
 - 1.4.11 Platelet function test, Ristocetin co-factor assay
 - 1.4.12 Mixing study, Factor VIII and IX assay, urea solubility test, fibrinogen assay, Factor VIII: C inhibitor study, Test for D dimer
 - 1.4.13 Antithrombin III, protein C and protein S assay
 - 1.4.14 Serum Vitamin B12, serum folate, red cell folate estimation
 - 1.4.15 Iron and reticulin stains in bone marrow
 - 1.4.16 Fetal hemoglobin
 - 1.4.17 LE cell phenomenon

2. Blood Banking

- 2.1 History of transfusion medicine
- 2.2 Blood collection and management
- 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: definition, types of pheresis, techniques and its importance
- 2.10 Blood transfusion reactions: laboratory diagnosis and management

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3. Immunology

- 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 Autoimmune 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 immuno 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, Flow cytometry, Mixed lymphocyte culture, NK cells neutrophil function test and histocompatibility testing for organ transplant.

4. Medical statistics and information technology

- 4.1 Explain the importance of statistical methods in assessing data from cases and experimental studies, correlation coefficient, expected versus observed and their interpretations.
- 4.2 Calculate central tendency, standard deviation and standard error from obtained data.
- 4.3 Familiarity with the use of the computer and other telecommunication devices like the fax for the storage, retrieval and sending of information.
- 4.4 Search for information in the internet by electronic mail.
- 4.5 Laboratory Information System (LIS).

5. Human molecular genetics

- 5.1 Fundamentals of central dogma (DNA, RNA and proteins; mutations), Chromosome structure and function (organization; structure-function relationship; chromosome abnormalities).
 - 5.2 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)
 - 5.3 Mutation and instability of human DNA (mutation and polymorphism; pathogenic mutations, repeat expansions), Molecular pathology (types of mutations; animal models for human disease)
 - 5.4 Identifying human disease genes (functional cloning versus positional cloning; mutation screening), Complex diseases; The Human Genome projects.
6. Laboratory techniques of sample collection, preservation and transportation; for microbiological, biochemical and pathological specimens

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7. Total Quality Management and Laboratory accreditation
 - 7.1 Quality assessment of samples, preservation, transportation, preparation, testing
 - 7.2 Quality assessment of reagent, kits and calibration of equipments
 - 7.3 Quality assessment of methods of testing and reporting
 - 7.4 Medical laboratory accreditation: importance, requirements, initiation, documentation, processing for laboratory accreditation
8. Medical Jurisprudence
 - 8.1 Medical ethics, philosophy and practice
 - 8.2 Right and duties of medical laboratory practitioner
 - 8.3 Professional negligence and malpractice
 - 8.4 Handling, preservation, testing, reporting and recording of specimens for medicolegal cases
 - 8.5 Giving evidence as an expert witness
9. Automation and maintenance of laboratory equipments
 - 9.1 Types of auto analyzers and their maintenance
 - 9.2 Advantages and disadvantages of automation in laboratory
10. Research Methodology
 - 10.1 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
 - 10.2 Data collection: source of data, primary and secondary data, collection methods, data processing and analysis
 - 10.3 Research design: types of research designs, hypothesis formulation and testing
 - 10.4 Test procedures-parametric and non-parametric tests; ANOVA; chi-square test; multi-variate analysis, research report, plagiarism
 - 10.5 Technical writing and reporting of research
11. Recent advances in laboratory medicine: digital-pathology, virtual-pathology, tele-pathology, experimental-pathology, automation in fluid-cytology, stem cell processing and storage for transplantation, advances in the development of vaccines, tumor markers and estimation and interpretation of AFP, B-hCG, CEA, CA125, CA 19-9, CA 15-3, PSA,
12. Laboratory hazards, safety precaution and laboratory waste management
 - 12.1 Bio-safety levels and bio-safety guidelines, bio-security, Hazards in histopathology and safety precautions.
 - 12.2 Different ways of sterilization
13. Miscellaneous
 - 13.1 CSF analysis
 - 13.2 Urine analysis
 - 13.3 Semen analysis
 - 13.4 Stool examination
 - 13.5 Museum techniques

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Group-B

25%

1. Histopathology

- 1.1. Identify and describe the gross anatomical alterations in the surgically removed specimens.
- 1.2. Correlate the gross pathological findings of the lesions of gastrointestinal, cardiovascular, respiratory, renal, reproductive, musculoskeletal, skin, eye, ENT, endocrine, neuromuscular and central nervous systems with the given clinical information.
- 1.3. 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
- 1.8. Explain the steps and principles of routine H & E staining and special staining techniques and mounting them.
- 1.9. Interpret the microscopic findings of various types of lesions of gastrointestinal, cardiovascular, respiratory, renal, reproductive, musculoskeletal, skin, eye, ENT, endocrine, neuromuscular and central nervous systems.
- 1.10. Recall the pathological changes in tissues and organs in above mentioned systems.
- 1.11. Give diagnosis, differential diagnosis and opinion of pathological lesions and correlate with the clinical findings provided.
- 1.12. Describe the normal physiology of renal electrolytes, endocrine and reproductive systems.
- 1.13. Frozen Section
 - 1.13.1. Describe the principle and function of cryostat.
 - 1.13.2. Perform frozen section of intraoperative specimens and diagnose.
- 1.14 Principle and techniques of immuno-histochemistry and immuno-fluorescence
- 1.15 Autopsy pathology
 - 1.15.1. Describe complete/partial autopsy and preservation of tissues and organs
 - 1.15.2. Identify the gross and microscopic features found in autopsy body and tissue sections respectively and correlate it with clinical history and diagnosis
 - 1.15.3. Write the provisional and final diagnosis reports

2. Cytopathology

- 2.1. Describe the normal cell morphology in vaginal, cervical and endometrial specimens and sputum specimen.
- 2.2. Explain cytopreparatory technique
- 2.3. Describe different types of fixatives and methods of fixation used in cytopathological laboratory and explain their functions.
- 2.4. Perform fine needle aspiration biopsy procedure, prepare wet and dry smears fix and stain the slides with Pap stain and Giemsa stain.

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- 2.5. Explain the principle of Pap stain and Giemsa stain.
- 2.6. Interpret the cellular morphological changes in sputum, vaginal, cervical and endometrial specimen and diagnose neoplastic and inflammatory conditions.
- 2.7. Describe the normal cell morphology in brushing, washing and body fluids smears.
- 2.8. Interpret the cellular morphological changes in brushing, washing and body fluid smears in different inflammatory, non-inflammatory, non-neoplastic and neoplastic conditions.
- 2.9. Explain sex chromatin. Describe the methods of obtaining and preparation of smears for the examination of sex chromatin.
- 2.10. Describe the congenital anomalies in relation to sex chromosome.
- 2.11. Interpret FNAC smears and diagnose the lesions.
- 2.12. Bone-marrow aspiration/Biopsy techniques and interpretation.

Group- C

25%

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 Photometric measurement of light, Beer's law and Lambert's law and their limitations
 - 1.2.3 Automation in biochemistry; wet and dry chemistry analyzer
 - 1.2.4 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
 - 1.2.5 Collection, handling and storage of sample, influence of temperature, nutrition, drugs, posture
 - 1.2.6 Separation techniques including various chromatography techniques and electrophoresis
 - 1.2.7 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 & nephrotic syndrome

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- 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
- 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 hyperfunction
 - 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 gastro intestinal 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
- 2. Microbiology**
 - 2.1 General microbiology
 - 2.1.1 Microbial genetics
 - 2.1.2 Pathogenesis of bacterial infection
 - 2.1.3 Normal flora of skin, mouth, respiratory tract, intestine, urethra, vagina and conjunctiva
 - 2.1.4 Preparation and storage of culture media

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- 2.1.5 Mechanism of action of antimicrobial drugs
- 2.1.6 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
- 2.1.7 Quality control in procedure, culture media, equipments
- 2.2 Systemic microbiology
 - 2.2.1 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
- 2.3 Bacteriology
 - 2.3.1 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*
 - 2.3.2 Bacteriological examination of water, milk, food, air and pharmaceutical products
 - 2.3.3 Collection, transport and processing of different specimens for microbiological examination
 - 2.3.4 Organisms encountered in CSF, blood culture, sputum, pus, urine, stool, body fluid aspirate and methods of isolation of such organisms
 - 2.3.5 Pathogenesis, lab diagnosis, prevention and control of emerging bacterial infections
- 2.4 Virology
 - 2.4.1 General features and types of viruses.
 - 2.4.2 Pathogenesis of viral carcinogens.
 - 2.4.3 Pathogenesis, lab diagnosis, prevention and control of emerging viral infections
 - 2.4.4 Properties, pathogenesis and diagnosis of the medically important virus
 - 2.4.5 Laboratory procedures for isolation of virus
- 2.5 Mycology
 - 2.5.1 General properties and classification of fungi
 - 2.5.2 Morphology, pathogenesis and diagnostic laboratory tests for superficial, deep and systemic mycosis
 - 2.5.3 Laboratory procedure for identification of fungal pathogens in clinical specimens
- 2.6 Parasitology
 - 2.6.1 Study of morphology, life cycle, developmental stages, symptoms, pathogenesis, epidemiology, diagnosis, and prevention of medically important parasites
 - 2.6.2 Demonstration of parasites in clinical specimens including methods of sample collection and preparation.
