

**FURTHER DETAILS REGARDING MAIN TOPICS OF
PROGRAMME NO. 11/2014 (Item No. 16)**

JUNIOR SCIENTIFIC OFFICER

HEALTH SERVICES

(CATEGORY No. 351/2012)

PART I: BIOCHEMISTRY

Chemistry of Biomolecules:

Carbohydrate, Protein, Lipid, Nucleic acid

Physical Chemistry:

Viscosity, Surface tension, Osmosis, Donnan membrane equilibrium, dialysis, diffusion, adsorption, partition coefficient.

Biomembranes:

Chemistry, Structure, transport process across biomembranes

Instruments and Methodology:

Photometry, spectrophotometry, fluorometry, Flame photometry, atomic absorption spectroscopy, Nephelometry, NMR Chemiluminescence, flow cytometry, Electron Spin resonance, Mass spectroscopy, X-ray crystallography, centrifugation, lyophilization, Ph meter, Sonicator, Chromatography and Electrophoresis.

Digestion and Absorption:

Carbohydrates, proteins, lipids, vitamins, minerals.

Nutrition:

Caloric values of food, BMR, respiratory quotient, glycemic index

Respiration:

Exchange of gases, Dissociation curve, Bohr effect, Chloride shift free radical formation, antioxidants.

Detoxification:

Phase I and II, Microsomal and non microsomal metabolism of drugs – role of cytochrome P₄₅₀ enzymes and subtypes.

Metabolism and Inborn errors of metabolism:

Carbohydrate, Protein, Lipids, Nucleic acid, heme, vitamins (A, D, E, K, B and C), Minerals (Ca, P, Mg, Na, K, Cl, Fe, Cu, Zn, I, Co, Ni, F)

Hormones:

Classification, mechanism of action, regulation, secretion, Chemistry, Metabolism, biological functions and disorders of Hypothalamus and pituitary, Thyroid, Parathyroid, Pancreas, Adrenal, Gonadal hormones.

Electron Transport Chain:

Thermodynamics of electron transport, Components and different complex in ETC, inhibitors of ETC, mitochondrial electron transporters and shuttle systems.

Enzymes:

Classifications, co-enzymes, cofactors, mechanism of enzyme action, factors affecting enzyme action, enzyme kinetics, enzyme inhibition, regulatory enzymes, enzyme immobilization, clinical enzymology, uses of enzymes in industrial technology, Isoenzymes.

Function Tests:

Liver, Renal, pancreas, Thyroid, Gastric, Fetoplacental, Gonadal, Malabsorption studies.

Buffer System:

Body buffers, acid base regulation, preparation of buffer solution, electrolytes and blood gas analysis.

Glass Wares:

Calibration, cleaning of glassware for various investigations.

Body fluid analysis, analysis of renal and biliary calculi, purification of water and quality checking.

Inter conversion of units:

Molar, Millimolar, Normal, Milliequivalent, Molality, osmolality, percentage.

Principles, procedure and normal values of various parameters analysed in clinical chemistry laboratory.

Quality Control:

Internal and external QC program, QC charts, QC samples

Automation:

Various types of Autoanalysers (semi and fully autoanalysers), advantages and disadvantages

Immunology:

Antigen, antibody, monoclonal and polyclonal antibodies, immunoglobulin classes antigen – antibody reactions, complement system, hypersensitivity reactions, MHC, cytokines, cell mediated and humoral immunity, Autoimmunity and autoimmune diseases, vaccines and immunization.

Immunological Techniques:

Agglutination, precipitation, immunodiffusion, Immunoelectrophoresis, complement fixation, Immunofluorescence, ELISA, RIA, Nephelometric Immunoassay, Chemiluminescence immunoassay, Western blotting, Flow cytometry, FACS.

Molecular Biology:

Cell cycle, DNA replication, DNA repair, Transcription, genetic code, Post transcriptional processing, reverse transcriptase, protein synthesis, post translational modifications, protein targeting, inhibitors of protein synthesis, gene expression, Operon, chromosomes, gene amplification, gene switching, recombination, enhancers, mutations.

Recombinant DNA Technology:

Restriction endonuclease, DNA ligase, Vectors, Chimeric molecules, cloning, Vectors, Gene library, Hybridisation, blotting techniques and applications, RFLP, Gene therapy, Transgenesis, DNA finger printing, DNA sequencing, DNA probes, Hybridoma technology, PCR, Pre-natal diagnosis of genetic disorders.

PART II: GENERAL MICROBIOLOGY

History and scope of microbiology, safety methods in microbiology laboratory, sterilization and disinfection, testing of disinfectants, quality control in sterilization, microscopes, different types, principles, application, parts of each type of microscope, micrometry, Bacterial cell, stains and staining methods, classification of medically important bacteria, fungus, viruses and parasites, bacterial metabolism, growth curve, growth requirements, culture media, cultivation and identification methods. Bacterial genetics, Genetic Engineering.

Systematic and Diagnostic bacteriology

Medically important bacteria, bacterial infections, pathogenesis, epidemiology, isolation and identification, clinical specimens and diagnostic methods, zoonotic infections, antibiotic resistance mechanisms, antibiotic sensitivity tests, serological tests for the diagnosis of bacterial, viral, fungal and parasitic infections.

Parasites and diagnostic parasitology,

Classification, geographical distribution, habitat, morphology, life cycle, pathogenesis, epidemiology, immunology, prophylaxis, laboratory diagnosis of medically important parasites and their infections, protozoa and helminthes – intestinal, blood and tissue parasites collection, transportation, examination of clinical specimens for parasites.

Systematic and Diagnostic Mycology:

Classification, geographical distribution, structure and morphology, mode of transmission, pathogenesis, epidemiology, immunology, prophylaxis, laboratory methods for the diagnosis of fungal infections, various techniques used for the identification of fungi culture media in mycology, stains in mycology, serological tests for mycotic infections, preparation of fungal

antigens & their standardization, superficial mycoses, subcutaneous mycoses, systemic mycoses opportunistic mycoses, miscellaneous mycoses, mycotoxins, allergic fungal diseases, animal models in mycology.

Medical Virology:

Systemic and clinical virology, pathogenesis, processing of clinical specimens and laboratory diagnosis of viral infections, emergence and re-emergence of viral infections, diagnostic tests in virology, applied and recent advances in medical microbiology – nosocomial infections, epidemiological aspects of control of infections and diseases, typing methods in bacteriology, surgical and trauma related infections.

Microbial bio-film-prevention, control and removal, role of microbiology lab for infection control in hospital, emerging infectious diseases, public health microbiology – microbial analysis of water, air, milk and food, molecular diagnostic methods in microbiology, automation in diagnostic microbiology, management and organization of microbiology laboratory, quality in the clinical microbiology laboratory, genetically modified microorganisms, molecular diagnostic techniques relevant to medical microbiology, PCR and its modifications, Principles of recombinant DNA technology.

Care and management of laboratory animals, handling feeding, breeding of common laboratory animals, bleeding of lab animals, killing of animal and disposal of carcasses, animal inoculation, animal house organization and management.

PART III: PATHOLOGY

Haemopoiesis, anaemia, leukemia – classification and lab diagnosis, thalassemia, haemoglobinopathies, invitro and invivo anticoagulants, coagulation factors, mechanism, disorders and lab diagnosis, investigations of thrombotic tendency, platelet function tests, complete blood cell count and special laboratory investigations in hematology laboratory, automation in hematology laboratory.

Fixatives, decalcification, tissue processing, routine and special stains in histopathology laboratory, immunohistochemistry, molecular markers of malignant neoplasm, micotomy and frozen sectioning, tissue processing for electron microscopic investigations, automation in histopathology laboratory, museum mounting techniques.

Chromosome organizations and relative diseases, karyotyping, bonemarrow preparation and culture techniques of various cytogenetic samples, banding techniques, sex chromatin determination.

Cytology of female genital tract, respiratory tract, cytology of body fluids, cytocentrifuge, cell block, routine and special stains used in diagnostic cytology, FNAC.

Blood group antigens, grouping techniques, screening of donors, diseases transmitted through blood transmission, nucleic acid testing, compatibility testing, ICT, DCT, Blood collection, preservation, processing and storage, blood component preparation, aphaeresis, autologous and exchange transfusion, blood transfusion reactions and its management, hemolytic disease of new born, blood substitutes.

HLA typing and cross matching, MHC antigen and its importance in transplantations, molecular diagnostic techniques in the diagnosis of haematological disorders, FISH, Flow cytometry, Immuno phenotyping, autoimmune disorders, tumor markers, quality control and quality assurance in haematology, cytology, histopathology, clinical pathology laboratory and blood bank.

Urine analysis, stool, semen analysis, sputum, body fluids, CSF, pregnancy testing, safety in pathology laboratory.

Part IV

General Knowledge, Current Affairs & Renaissance in Kerala.

NOTE: - It may be noted that apart from the topics detailed above, questions from other topics prescribed for the educational qualification of the post may also appear in the question paper. There is no undertaking that all the topics above may be covered in the question paper.