Alagappa University, Karaikudi

Syllabus for Pre-Registration Qualifying Entrance Examination for Ph.D. Program

Discipline : Biomedical Sciences

(From August 2021 onwards)

Structure of bacteria, fungi, algae, protozoa and viruses. Classification of microbes (Genetic level) – Conventional and modern methods. Biology of micro-organisms used in Genetic Engineering. Methods of studying the microorganisms, methods of collection, enumeration (total and viable counts), isolation, culture and identification based on morphological, physiological and biochemical characteristics. Microbial nutrition – Microbial nitrogen fixation, carbon, nitrogen and phosphorus cycle-decomposition of organic matter – microbial biodegradation of natural and synthetic waste materials. Food microbiology – normal genera associated with fish, food spoilage, fish and human pathogens. Indicator of pollution – fecal coli forms – prevention and control.

Classification of carbohydrates, proteins, aminoacids, nucleic acids and lipids –Enzymes – nature, classification. Mechanism of enzyme action. Factors affecting enzyme activity. Metabolism of Carbohydrates – glycolysis and citric acid cycle. Metabolism of aminoacids-urea cycle. Brief account of fatty acid metabolism-oxidation and fatty acid biosynthesis. Synthesis and oxidative phosphorylation – ATP synthesis. Molecular Organization of cell membrane – membrane lipids and membrane proteins. The fluid mosaic model. Transport mechanisms: Diffusion (passive and facilitated)-Active transport. Endocytosis and exocytosis.

Cell-Structure of Cell – Function of each Components of the cell. The cell cycle-interphase, G_1 S and G_2 phases-regulation of cell cycle. Structure of nucleic acids: DNA double helix, types of RNA-mRNA, rRNA, and tRNA. Subunit structure of ribosomes in prokaryotes and eukaryotes. Properties of nucleic acids- denaturation. DNA supercoiling-DNA – binding proteins. Polytene chromosome-lamp brush chromosomes and β-chromosomes. The eukaryotic chromosome – centromere, telomere, chromatin, histones and nucleosomes. The eukaryotic genome –mitochondria and chloroplast. Replication-Semi conservative model. Enzymes involved in replication – helicases, topoisomerases, DNA polymerases, DNA ligase. Mechanism of DNA replication in bacteria and eukaryotes. DNA damage, repair and recombination: Mutagens – physical and chemical. Regulation of transcription in eukaryotes: post transcriptional processing of mRNA, rRNA and tRNA- splicing.

Elements of immunology- Central and peripheral lymphoid organs, Thymus, Bone marrow, Bursa of Fabricus, lymph node and spleen. Immunoglobulins – structure, functions, classes, isotypes allotypes and idiotypes. Types of immunity, innate and acquired immunity. Humoral immunity and cell mediated immunity. Lymphokines and cytokines. T-cell and B-cell receptors. Immunoprecipitaion. Immunocelectrophoresis. Immunoblottting. Radio immunoassay. ELISA. MHC complex – gene organization. HLA genes class I & II antigens, structure and function - Histocompatibility testing. Transplantation-types, genetics of

transplantation, Hypersensitivity – Types. Autoimmuity. Immunodefeciency disorders. B-cell and T-cell deficiencies. Blood Cell – Composition – Origin of RBC – Blood Groups – Estimation of RBC, WBC and platelet.

General Pharmacology: Routes of drug administration, absorption, distribution. Metabolism and execretion of drugs. Drug tolerance, drug resistance, drug dependence, drug habituation, synergism and antagonism in combination of drugs. Drugs Acting on Gastro intestinal tract such as purgatives, peptic ulcer and antidialThoeals. Local anaesthetics. Drugs acting on Central nervous system: General anaesthetics, narcotic analgesics, non-narcotic analgesics and anti-inflammatory agents, psychopharmacological agents - tranquilizers and antidepressants. Drugs acting on Respiratory system: antitussives and bronchodialators. Drugs acting on Urinary system: diuretics.

Drugs acting' on Autonomic nervous system: Parasympathomimetics and parasympatholytic agents, Adrenergic and adrenergic blocking agents, Neuromuscular blocking agents, drugs acting on eye. Drugs acting on Cardiovascular system: Caridiac giycosides, antiarrthymics, antihypertensive and antilipidemic drugs and anticoagulants. Autocoids: Histamines, and antihistamines, Renin-angiotensins. Chemotherapy: Introduction, sulphonamides, penicillin, aminoglycosides, Erythromycin, Fluroquinolones and Nalidixic acid. Chemotherapy of tuberculosis, leprosy, malaria, anticancer drugs, antifungal antiviral drugs. Vitamins in therapeutics. Antiseptics and disinfectants. Drug toxicities, general principles of treatment of poisoning. Heavy metal poisoning and treatment. Drugs acting on Endocrine system: Hypothalamo pituitary hormones, thyroid and anti-thyroids, Insulin, oral hypoglycemiC agents, hormones of adrenal cortex, sex hormones, oral contraceptives and anabolic steroids.