

Syllabus for Entrance Test - Admission to Ph.D. Programmeacademic session 2025-26

The question – cum answer booklet will have two parts. Part I have to be attempted in one hour and it will consist of 50 multiple choice questions (MCQ) to test the research aptitude of candidates. Part II to be attempted in one hour will also consist of 50 multiple choice questions (MCQ) to test the domain knowledge of candidates. The syllabus for Part I for all Ph.D. programmes will be same. The questions will be of Master's degree level. The syllabus for Part I and Part II is given below:

Part I: It will cover general principles of research including critical thinking, formulation of hypothesis and its testing. Development of research plan. Major portion of the question paper will be from biostatistics covering following content:

- a). Variability and its measures: Types, biological, real, experimental, measures of variability, range, semi-interquartile, range (Q), mean deviation, standard deviation (SD), coefficient of variation (CV), standard error of mean, applications and uses, standard error of difference between two means of large sample, small sample, t-test unpaired, paired, variance ratio test, analysis of variance. Normal distribution and normal curve: Demonstration of a normal distribution, normal curve, standard normal deviate(z), asymmetrical distributions. Probability: Addition law of probability, multiplication law, binomial probability distribution, probability chance from shape of normal distribution or normal curve.
- b). The Chi-square Test: Alternate test to find significances of difference in two or more than two proportions, as a test of association between two events in binomial or multinomial samples, as a test goodness of fit, calculation of χ^2 value, restrictions in application of χ^2 test, Yates corrections.
- c). Tools of data collection: Type of data, construction of schedules and questionnaires, measurement of scales and indices, pilot studies and pre-tests.
- d). Planning of Research: planning process, selection of a problem for research, formulation of the selected problem, hypothesis formation, measurement, research design/plan.
- e). Sampling: sampling techniques or methods, choice of sampling techniques, sample size, sampling and non-sampling errors. Sampling variability and significance: testing statistical hypothesis, tests of significance, Z-test, one-tailed and two tailed tests.
- f). Methods of data collection: Meaning and importance of data, sources of data, uses of secondary data, methods of collecting primary data, observation method, experimentation, simulation, interviewing, panel method, mail survey, projective technique, socio-metric methods.

Part II. Subject wise syllabus is given below

1. Medical Anatomy

General Anatomy, histology, Embryology, Neurology- Brachial Plexus, Radial, Median, Ulnar, Axillary & Musculocutaneous Nerve Mammary gland, blood Vessels, Neurology – Lumbar & Sacral plexus formation sciatic, femoral, obturator, tibial and common, peroneal Nerve & blood vessels, Peritoneum, Abdominal Organs – stomach, spleen, liver, biliary, apparatus, pancreas, small & large Intestine, kidneys ureters, suprarenal glands, Glands –Thyroid, Parathyroid, parotid, submandibular, sublingual, pituitary Viscera –Scalp, palatine tonsil, Middle ear, Part of External and internal ear, Meninges, fetal Skull, Subclavian, Carotid system, Ext & Internal, Jugular veins, venous sinuses, Lymphatic drainage of head & neck, Cranial Nerves, branches & cervical plexus, Brain & Neuroanatomy, Human Genetics.

2. Medical Biochemistry

Structure of atoms, molecules and chemical bonds. Composition, structure and function of biomolecules: Carbohydrates, lipids, proteins, nucleic acids and vitamins. DNA, RNA and Protein synthesis. Stabilizing interactions: Van der Waals, electrostatic, hydrogen bonding, hydrophobic interaction, etc. Principles of biophysical chemistry: pH, buffer, reaction kinetics, thermodynamics, colligative properties. Bioenergetics, glycolysis, oxidative phosphorylation, coupled reaction, group transfer, biological energy transducers. Principles of catalysis, enzymes and enzyme kinetics, enzyme regulation, mechanism of enzyme catalysis, isozymes. Conformation of proteins: Ramachandran plot, secondary structure, domains, motif and folds. Conformation of nucleic acids: Helix (A, B, Z), t-RNA, micro-RNA. Stability of proteins and nucleic acids. Metabolism of carbohydrates, lipids, amino acids nucleotides and vitamins.

3. Biotechnology

Application of biotechnology in agriculture, health care and industry. Gene concept. Linkage maps. Isolation, cloning and mapping of genes. Isolation and purification of RNA, DNA (genomic and plasmid) and proteins, different separation methods. Analysis of RNA, DNA and proteins by one and two dimensional gel electrophoresis, Isoelectric focusing. Molecular cloning of DNA or RNA fragments in bacterial and eukaryotic systems. Recombinant DNA technology, Expression of recombinant proteins using bacterial, animal and plant vectors. Isolation of specific nucleic acid sequences. Generation of genomic and cDNA libraries in plasmid, phage, cosmid, BAC and YAC vectors. In vitro mutagenesis and deletion techniques, gene knock out in bacterial and eukaryotic organisms. Protein sequencing methods, detection of post translation modification of proteins. DNA sequencing methods, strategies for genome sequencing. Methods for analysis of gene expression at RNA and protein level, large scale expression, such as micro array based techniques. Isolation, separation and analysis of carbohydrate and lipid molecules. RFLP, RAPD and AFLP techniques.

4. Community Rehabilitation

Prevention, assessment, reduction, and adaptation to physical, cognitive, and psychosocial aspects of disability and functioning. Social Group Work in Rehabilitation, Family and Child Care, Administration of Rehabilitation Programmes, Financial Management in organizations for the Disabled.

5. Dental Sciences

Homeostasis, Composition & functions of blood, Body temperature, Functions of skin, General endocrinology, Enumeration of endocrine glands & hormones, Cardio vascular system, Digestive system, Carbohydrates, Lipids, Amino acids, Classification, Introduction to peptides., Proteins: Simple and conjugated; globular and fibrous, Outlines of glycolysis, pyruvate oxidation and citric acid cycle, Introduction to glycogenesis, glycogenolysis, fatty acid synthesis, lipogenesis and lipolysis. Gluconeogenesis, Glycosaminoglycans, Bone structure, Membranes, Human dentition, types of teeth, & functions, Palmer's & binomial notation systems, Epithelial mesenchymal interaction, detailed study of different stages of development of crown, root & supporting tissues of tooth & detailed study of formation of calcified tissues, Detailed microscopic study of Enamel, dentine, Cementum & Pulp tissue. Age changes, Detailed microscopic study of Periodontal ligament & alveolar bone, Detailed microscopic study of Oral Mucosa, Salivary Glands, TM Joint, Maxillary Sinus, Saliva, Calcium, Phosphorous & fluoride metabolism, Physiology of Taste, Different pathological processes involving the oral cavity & oral cavity involvement in systemic diseases, Developmental disturbances of teeth, jaws and soft tissues of oral & paraoral region, Microbial infections of oral soft tissues, Common non-inflammatory diseases involving the jaws, Cysts of the Oral & Para oral region, Tumors of the Oral Cavity, Traumatic, Reactive & Regressive lesions of Oral Cavity, Non neoplastic Salivary Gland Diseases, Systemic Diseases involving Oral cavity,

Mucocutaneous Lesions, Pigmentation of Oral & Paraoral region & Discoloration of teeth, Infections of the Oral cavity, Morphologic Development of Craniofacial Structures, Development of periodontal tissues-anatomy, histology, Defensive mechanisms in the oral cavity, Classification of periodontal diseases, Gingival disease, Epidemiology of periodontal disease, Implants.

6. Medical Genetics

Theories and principles explaining transmission of traits from parents to off springs. Model organisms for genetic studies. Inheritance of quantitative traits: central dogma (DNA, RNA), genetic material, gene function, gene regulation, chromosomal aberrations, Sex determination. Epigenetics. Mutation, Mapping of genes, Recombinant DNA technology. DNA synthesis, DNA sequencing techniques. Genetics for health sciences. Infection and Immunity, Antigens, Antibodies– Immunoglobulin (Monoclonal Antibodies), Antigen–Antibody Reactions, Complement system, Structure and Functions of the Immune system, Immune response–Humoral and cellular, Hypersensitivity, Histocompatibility system.

7. Health Professions Education

Organization and Administration of Health Programs, Applied epidemiology, Health Program Planning, Behavioral Foundations of Healthy Education, Advanced health Behavior Theory, Experimental design in health education, Qualitative Research methods, Statistics.

8. Hospital Administration

Health care and hospital environment, Human Biology and Medical terminology, Health care economics, Organization and management process, Information technology for hospitals, Quantitative techniques for management, financial management, patient behavior and care, quality management in hospital.

9. Microbiology

Introduction to Bacteriology and morphology of bacteria, Growth and Nutrition of Bacteria, Bacterial Genetics, Sterilization and Disinfection, Culture media and Culture Methods, Microbial Pathogenicity, Antimicrobial agents, their mode of action and resistance, Bacterial Taxonomy. Microbial diseases: Tuberculosis, AIDS, candidiasis, malaria. Important diseases of plants: Downy mildew of pearl millet, panama wilt of banana, bacterial leaf blight of rice, TMV. Antibiotics: Types, mode of action and resistance. General outline and classification of viruses, bacteriology. Mycology: Introduction and classification of fungi and fungal diseases. General Virology/Properties of Viruses

Infection and Immunity, Antigens, Antibodies– Immunoglobulin (Monoclonal Antibodies), Antigen–Antibody Reactions, Complement system, Structure and Functions of the Immune system, Immune response–Humoral and cellular, Hypersensitivity, Histocompatibility system.

10. Nursing Sciences

Current trends and issues in Child Health Nursing, Pre-natal Pediatrics and Growth & Development of children, Behavioral and Preventive Pediatrics, Community Health Nursing: Community Health Nursing Trends & Issues, Population dynamics and control, Epidemiology, National Health and Family Welfare Programmes, IMNCI (Integrated Management of Neonatal and Childhood Illness) module, Medical Surgical Nursing, Current trends in Adult Health Nursing, Health Assessment and care of patients in hospital setting, Management of patients with disorders of gastro intestinal tract, nervous system, respiratory system, cardio vascular system, blood, Genito urinary system, endocrine system, musculo – skeletal system, integumentary system, Eye & ENT and reproductive system, Geriatric nursing, Emergency, trauma and multi system organ failure, Current trends and issues in Mental Health Nursing, Stress Management and Therapeutic Communication & Interpersonal relationship,

Psycho Social and Physical Therapies, Psychiatric disorders, Substance related disorders, Obstetrics & Gynecological Nursing, Current trends and issues in Maternal Health Nursing, Pregnancy, Normal Labour and Puerperium & Nursing Management.

11. Pharmaceutical Sciences

Stereochemistry, reaction mechanisms, structure and reactivity. Aliphatic and aromatic substitutions. Elimination reactions, reaction of Yields, Alkylation. Pericyclic reactions, Metal and non-metal mediated oxidation and reductions. Protection and deprotection of functional groups, Rearrangements, replacement and systematic nomenclature, asymmetric synthesis. Approaches to green chemistry. Basics of drug action, delivery, design and discovery.

12. Medical Physiology

General physiology, body fluids and blood, nerve and muscle, git and nutrition, excretory system, skin and body temperature, respiratory system, cardiovascular system, endocrine glands, reproductive system, nervous system, special senses.

13. Medical Pharmacology

Basic principles of pharmacology, Concept of receptors as a drug target. GPCR- Classification, structure, drug receptor interaction, G-protein, receptor characterization, receptor theories, agonist, antagonist. Receptor regulation: GPCR desensitization, down regulation, up regulation. Regulators of G-protein signaling. Ion channels and Ion channel linked receptors and their regulation. Nuclear receptors. Tran membrane signaling mechanisms. Second messenger system. Transcription factors: Nrf2 Mechanism of action, pharmacological target and role in different diseases conditions. Dose response relationship and different type of antagonism. including receptor mechanisms, drug distribution and metabolism, and pharmacokinetics.

14. Audiology and Speech-Language Pathology

Development of Audiology and speech language pathology in Indian and global context. Neuro-physiological basis of speech – neuro-motor mechanism of the articulatory, phonatory and respiratory systems, physiology of nerve conduction, types of synapses neurotransmitters, synthesis and activation of neurotransmitters; neurotransmitters in normal and disordered population. Hearing impairment, Intellectual Deficit, tests to identify dead regions of cochlea. Autism Spectrum Disorder. Fluency and its Disorders. Cochlear implants and brainstem implants. Principles of AEP recording techniques. Cochlear implants and brainstem implants. Standardized tests to assess hearing impairment in children and adults. Important laws, regulations and professional ethics for clinical work in ASLP. Welfare measures relating to persons with speech-language impairment.

15. Radiodiagnosis

The fundamentals of imaging physics, including X-ray, CT, MRI, ultrasound, and nuclear medicine techniques. It covers detailed radiological anatomy and pathology across all organ systems, emphasizing accurate interpretation of normal and abnormal findings. Students are trained in diagnostic procedures such as contrast studies, Doppler imaging, and image-guided interventions. The curriculum includes advanced cross-sectional imaging protocols for neuro, thoracic, abdominal, and musculoskeletal systems, along with emergency and trauma radiology for acute care assessment. Radiation safety, dose optimization, and ethical considerations form a core part of training. Recent

advances such as artificial intelligence in radiology, hybrid imaging modalities (PET-CT/MRI), and molecular imaging applications.

16. Clinical Psychology

Core psychological domains including in-depth psychopathology, DSM-5 diagnostic criteria, and advanced theories of psychological disorders. Proficiency in evidence-based psychotherapeutic approaches, including cognitive-behavioral therapy (CBT), dialectical behavior therapy (DBT), and psychodynamic therapies. Developmental psychology focusing on lifespan development and its impact on mental health, neuropsychological assessment, advanced neuroanatomy, clinical supervision, psychopharmacology, and current trends in mental health research and policy.

Syllabus common for all subjects – questions from this section may be asked in Part I and Part II.

Basic techniques for research

Enzyme assay, enzyme activity and specific activity determination. Cell disintegration and extraction techniques, separation of proteins by fractionation (ammonium sulphate, organic solvents). Ion exchange chromatography, molecular sieve chromatography, affinity chromatography, paper chromatography, thin layer chromatography, gas chromatography, ultra filtration, Ultracentrifugation. Gel electrophoresis, isoelectric focusing and immunoelectrophoresis, capillary electrophoresis, pulse field electrophoresis. Microscopy, HPLC, HPTLC, GC-MS, FTIR, SEM/TEM, NMR, AAS, UV visible spectrophotometer.