

## Syllabus for Entrance Test - Admission to Ph.D. Programme

**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  $\chi^2$  value, restrictions in application of  $\chi^2$  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. 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, billiary, 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. 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. 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.

## **4. 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, Tumours 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 & Discolouration 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.

## **5. 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.

## **6. 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.

## **7. 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. Transmembrane 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.

**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.