Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal (M.P.)

Syllabus for Entrance Examination for Admission in Ph.D. Program

PHARMACY

1. **Basic Pharmaceutics, Drug Delivery and Regulatory Affairs**
   Micromeretics and powder rheology, surface tension and interfacial phenomena, viscosity and rheology. Identification techniques of microbes, cultivation, isolation of microbes, principles of sterilization. Basic principles of evaporation, distillation, drying, size reduction, mixing, crystallization, filtration and centrifugation. Classification, designing, manufacturing, packaging and evaluation of various dosage forms. Approved conventional and novel formulation excipients. Controlled and novel drug delivery systems, drug targeting. Techniques for in-vitro and in-vivo testing. Invitro-Invivo correlation. Pre-formulation studies. Physical, chemical and therapeutic incompatibilities. General considerations & concepts of chemical kinetics and drug stability. Biopharmaceutical aspects of dosage form design, principles of pharmacokinetics. Bioavailability and bioequivalence studies, dosage regimens, repetitive dosing and dose adjustments in renal and hepatic failure, individualization of dosage regimen. BCS Classification of drugs, ICH guidelines. Concept of pharmaceutical quality management, requirements of GMP, GLP, GCP, regulatory requirements of drugs and pharmaceuticals.

2. **Pharmaceutical and Medicinal Chemistry**
   Basic organic chemistry regarding synthesis and reactions of the main organic functional groups, organic stereochemistry, substitution (free radical, nucleophilic, electrophilic); elimination reactions; addition reactions; rearrangement reactions, General pathways of drug metabolism, Basic concepts and application of prodrug design, Biochemical mechanism of drugs, categories of drug with special reference to SAR, Mode of action, Classification and synthesis of anticancer, NSAIDs, anti-infective, antihistaminic, anxiolytics, sedatives, hypnotics, anticonvulsants, adrenergic antagonists and general anesthetics. Radiolabelling, Drug designing and screening, concepts of QSAR and CADD.

3. **Pharmacology and Drug Therapeutics**
   Types of receptors, drug-receptor interaction including signal transduction, mechanism, drug action, side effects, and contraindications of drugs acting on central nervous system, autonomous nervous system, anticancer agents, NSAIDs, anti-infective, antidiabetic, antihypertensive, antiasthmetic and antihistaminic. Pharmacological screening, general principles, various screening models, screening methodologies (in-vitro and in-vivo tests). Bioassay methods, principles of toxicology, Chemotherapy and pathophysiology.

4. **Pharmacognosy and Biotechnology**

General methods of extraction, isolation, purification and characterization of natural products. Various separation techniques used for isolation of natural products. Biosynthetic pathways of various metabolites (e.g. Alkaloids, glycosides, tannins, lignans, saponins, lipids, flavonoids, coumarins, anthocyanidines etc.). Quality control of crude drugs, phytochemical screening methods, plant tissue culture.

Recombinant DNA technique, Fermentation, Immunology and vaccines. Enzyme immobilization, Genetics and gene therapy, Fundamentals of cell and molecular biology.

5. **Pharmaceutical Analysis**

Fundamental principles, basic instrumentation, and pharmaceutical applications of UV-Visible spectroscopy, Infrared spectroscopy, PMR, C13 NMR spectroscopy, mass spectroscopy of gas-liquid chromatography, HPLC, HPTLC, Gel chromatography, Electrophoresis and ion-pair chromatography. Introductory principle, instrumentation and application of GC-Mass, HPLC-Mass for complex mixtures.

Theory, methods and applications of enzyme and radioimmunoassay techniques, Thermogravimetric analysis (TGA), Differential scanning calorimetry (DSC), Differential Thermal Analysis (DTA), X-ray diffractometry (XRD), Electron microscopy. Stability indicating assay procedures, analytical method development and validation. Impurity profiling, drug estimation in biological samples. Analytical instrument validation.

6. **Statistics & Research Aptitude**

Mean, median, mode, basic concepts of probability, coefficient of variance, standard error, standard deviation, and regression analysis. Student t-test, F-test, analysis of variance (ANOVA), data graphics and data interpretation. Principles and various models of statistical optimization techniques, optimization softwares.

National and international scenario of pharmaceutical research, literature reviewing, reference citation, scientific and research journals, impact valuation, research article and patent drafting, various scientific websites, abstracts, pharmacopoeial drug monographs and official standards, national and international research institutions of repute.

Verbal reasoning

Analogy, Classification, Series Completion and Logical Deduction.

Non-verbal reasoning

Pattern perception, Figure matrix, Rule detection.