SYLLABUS FOR RESEARCH APTITUDE TEST IN PHARMACY

PART – B

This part is further divided into two Sections viz. Section-I & Section-II. Section-I is common for all the candidates. From Section-II, a candidate is required to *select One Elective* paper out of the four elective papers viz. Pharmaceutics, Pharmaceutical Chemistry, Pharmacognosy, and Pharmacology.

SECTION – I
UNIT -I

Pre-formulation studies: Study of physical properties of drug and organoleptic properties, their effect on formulation, stability and bioavailability.

Pharmaceutical Aerosols: Definition, propellants, general formulation, manufacturing and packaging methods, pharmaceutical applications.

Buffers: Buffer equations and buffer capacity in general, buffers in pharmaceutical systems, preparation, stability, buffered isotonic solutions, measurements of tonicity, calculations and methods of adjusting isotonicity.

Micro-encapsulation: Types of microcapsule, importance of microencapsulation in pharmacy, microencapsulation by phase separation, co-acervation, multi orifice, spray drying, spray congealing, polymerisation, complex, formulation, emulsion, air suspension technique, coating pan and other techniques, evaluation of micro capsules.

Tablets: Formulation of different types of tablets, granulation technology on large-scale by various techniques, physics of tablets making, different types of tablet compression machinery and the equipments employed, evaluation of tablets, evaluation of coated tablet; stability kinetics and quality assurance; approaches to sustained and controlled release dosage forms.

Parenteral Products: Pre-formulation factors, routes of administration, water for injection, pyrogenicity, nonaqueous vehicles. Formulation details, containers and closures and their selection. Prefilling treatment, washing of containers and closures, preparation of solution and suspensions, filling and sealing of ampoules, vial, infusion fluids, lyophilization andpreparation of sterile powders, equipment for large scale manufacture and evaluation of parenteral products.

UNIT-II

Methods of investigation of biosynthetic pathways, tracer techniques and autoradiography; isolation, characterization and purification with a special reference to their importance in herbal industries of following phytopharmaceuticals containing drugs, alkaloids- ephedrine, hyoscyamine, quinine, morphine, ergometrine, reserpine, vincristine, glycosides, digitoxin, scillaren, glycyrrhizin; steroids- sitosterols, hecogenin, diosgenin, coumarin, umbelliferone, antibiotics: penicillin, griseofulvin, tetracycline; distribution, isolation, purification and characterization of bioactive chemical constituents- steroids: diosgenin, hecogenin, guggulosterone and withanolides, alkaloids: morphine, ergometrine, quinine, reserpine, strychnine, vincristine, piperine, berberine, vasicine, glycosides: digitoxin, sennosides, bacosides, volatile oils: lemongrass oil, camphor, menthol, eugenol, antibiotics: penicillin, streptomycin, tetracycline, vitamins: cyanocobalamine

UNIT-III

Principles of Medicinal Chemistry: Physicochemical aspects (optical, geometric and bioisosterism) of drug molecules and biological action, drug-receptor interaction including transduction mechanism, concept of prodrug, mode of action, uses, structure activity relationship and synthetic of the following classes of drugs:
(i). drugs acting at synaptic and neuro-effector junction sites- cholinergic, anticholinergic and anticholinesterases: neostigmine, physostigmine, methacholine, pilocarpine, atropine, adrenergic drugs- ephedrine, isoproterenol, amphetamine, salbutamol, terbutaline, adrenaline, (ii). drugs acting on the central nervous system: general anaesthetics-thiopental, ketamine, methohexital; opioid analgesics- pethidine, methadone, pentazocine; anticonvulsants- phenytoin, carbamazepine, ethosuximide, valproic acid; CNS stimulants-caffeine, nikethamide, (iii). psychopharmcological agents: neuroleptiques- meprobamate, chlordiazepoxide, diazepam; antidepressants- imipramine, amitryptyline; antispasmodic and antiulcer drugs- dicyclomine, ranitidine, omeprazole.

UNIT-IV

General Pharmacology: Introduction to pharmacology, sources of drugs, dosage forms and routes of administration, mechanism of action, concept of receptors.

Pharmacology of ANS: Parasympathomimetic, parasympatholytics, sympathomimetics, adrenergic receptor and neuron blocking agents.

Pharmacology of CNS: General anaesthetics, alcohols and disulfiram, sedatives hypnotics, anti-anxiety agents & centrally acting muscle relaxants. psychopharmacological agents (antipsychotics), antidepressants. antiepileptic drugs, antiparkinsonism drugs, narcotic analgesics & antagonists, drug addiction and drug abuse.

Pharmacology of CVS: Cardiac glycosides, antihypertensive drugs, antianginal drugs, antiarrhythmics, antihyperlipidemics, therapy of shock.

Drug Acting on Hemopoeitic System: Haematinics, vit. k and anticoagulants, fibrinolytics and antiplatelet drugs, plasma volume expanders.

SECTION- II
(ELECTIVES / OPTIONALS)
ELECTIVE-I (PHARMACEUTICS)

Biopharmaceutics: Passage of drugs across biological barrier (passive diffusion, active transport, facilitated diffusion and pinocytosis); factors influencing absorption– physicochemical, physiological and pharmaceutical; drug distribution in the body, plasma protein binding.

Pharmacokinetics: Significance of plasma drug concentration measurement, compartment model and non-compartment model, definition and scope; pharmacokinetics of drug absorption– zero order and first order absorption rate constant using Wagner–Nelson, Loo-Reigelman method; volume of distribution and distribution coefficient; compartment kinetics– one compartment and preliminary information of multicompartment models; determination of pharmacokinetic parameters from plasma and urine data after drug administration by intravascular and oral route; clinical pharmacokinetics- definition and scope; dosage adjustment in patients with and without renal and hepatic failure; pharmacokinetic drug interactions and their significance in combination therapy.

Bioavailability and Bioequivalence: Measures of bioavailability, C-max, and area under the curve (AUC), review of regulatory requirements for conduction of bioequivalent studies, fast release- introduction, formulation and evaluation; transdermal drugs delivery system- factors influencing transdermal delivery, formulation and evaluation including iontophoresis and ionophoresis; target oriented drug delivery systems- prodrugs, liposome, niosome, nanoparticles microspheres and microparticles; lipoproteins activated carbons, cellular carriers, antibodies, DNA, and low molecular weight proteins; hormones, dextran and polysaccharides, synthetic polymers, nanoparticles, microparticles fabrication techniques (latest advances); nutraceuticals- introduction and scope.

ELECTIVE-II (PHARMACEUTICAL CHEMISTRY)

Principles of Drug Design: Traditional analogs, introduction to QSAR and mechanism based approaches, computer-aided drug design and molecular modeling; mode of action, uses, structure activity relationship of the following classes of drugs:

(i). cardiovascular agents: antianginal and vasodilators, antiarrhythmics, antihypertensives, anticoagulants, antihyperlipidemics and cardiotonics– nifedipine, procainamide, propranolol, methyldopa, captopril, clofibrate, warfarin, phenidione; (ii). antineoplastics- chlorambucil, 5-fluorouracil, methotrexate; (iii). analgesics and antipyretics- aspirin, mefeanamic acid, ibuprofen, diclofenac; (iv). antibacterials- sulphamethoxazole, sulphadiazine, sulphacetamide, nalidixic acid; (v). diuretics- acetazolamide, chlorthiazide; frusemide, spironolactone.

Steroids and related drugs: Introduction, classification, nomenclature and stereochemistry: androgens and anabolic steroids– testosterone, stanozolol. estrogens and progestational agents– progesterone, estradiol; adrenocorticoids– prednisolone, dexamethasone, betamethasone.

Antibiotics: Penicillins, semi-synthetic, penicillins, streptomycin, tetracyclines, cephalosporins, chloramphenicol, fluroquinolones; classification, mechanism of action, sar, synthetic approach and recent advances of fourth generation cephalosporins and fluroquinolones antibacterials; classification, mechanism of action, SAR, synthetic approach and recent advances of sex hormones and corticosteroids, prostaglandins, interferon and gene therapy; anti- HIV agents, ACE inhibitors and statins.

ELECTIVE-III (PHARMACOGNOSY)

Role of natural products in new drug development, plant derived drugs, novel drug templates; bioactive compounds from micro-organism with reference to antibiotics, anti-protozoals and marine natural products; structural elucidation insights for natural products by combination of classical, synthetic, degradative and spectral methods with reference to quercetin, tropanes and morphinan type alkaloids, quinine, digitoxigenin, camphor and caffeine, steroids, testosterone, progesterone, cortisone and antibiotic (beta- lactum).
Pharmacological screening of herbal drugs- introduction and evaluation of herbal drugs for antidiabetic, hepatoprotective, diuretic, anti-diarrhoeal, antiulcer, wound healing, cardiovascular, anti-inflammatory, analgesic, antipyretic, antifertility, anti-oxidant, anti-viral & cyto-toxic properties.Biomedicinals from plant tissue culture- Introduction, profile of plant tissue culture, bioproduction of commandable secondary metabolites, Hi-Tech products from plant sources with reference to Genistein, Comptophein, Rhein & Taxanes, Recombinant DNA technology.

ELECTIVE-IV (PHARMACOLOGY)

Drugs Acting on Respiratory System: Anti-asthmatic drugs, anti-tussives and expectorants, respiratory stimulants.

NSAIDS & Anti-Gout Drugs, Diuretics Autocoids: Histamine, 5HT and their antagonists, prostaglandins, thromboxans, leukotrienes, angiotensin and bradykinin.

Drugs Acting on GIT: Antacids and antiulcer drugs, laxatives and anti-diarrhoeal agents, emetics and antiemetics.

Pharmacology of Endocrine System: Hypothalamic and pituitary hormones, thyroid hormones and thyroid drugs, parathyroid, calcitonin and vitamin D, insulin, oral hypoglycaemic agents and glucagon; ACTH and cortico steroids, androgens and anabolic steroids, estrogens, progesterone and oral contraceptives, drugs acting on uterus.

Chemotherapy: General principles of chemotherapy, sulphonamides, cotrimoxazole, quinolines, antibiotics– penicillins, cephalosporins, chloramphenicol, tetracyclines, macrolides. chemotherapy of parasitic infections, tuberculosis, leprosy, malaria, fungal

ELECTIVE-V (PHARMACY PRACTICE)

Pathophysiology of common diseases: Parkinsonism, Schizophrenia, Depression and mania, Hypertension, Stroke (ischaemic and haemorrhage), Angina, CCF, Atherosclerosis, Myocardial infarction. Diabetes Mellitus, Peptic ulcer and inflammatory bowel diseases, Cirrhosis and Alcoholic liver diseases, Acute and chronic renal failure, Asthma and chronic obstructive airway diseases.

Health Education: WHO Definition of health, and health promotion, care for children, pregnant & breast feeding women, and geriatric patients. Commonly occurring Communicable Diseases, causative agents, Clinical presentations and prevention of communicable diseases – Tuberculosis, Hepatitis, Typhoid, Amoebiasis, Malaria, Leprosy, Syphilis, Gonorrhoea and AIDS, Balance diet, and treatment & prevention of deficiency disorders, Family planning – role of pharmacist.

Etiopathogenesis and pharmacotherapy: Hypertension, Congestive heart failure, Angina Pectoris, Myocardial infarction, Asthma, Chronic obstructive airways disease, Diabetes, Thyroid diseases, Urinary tract infections, Rheumatoid arthritis, Osteoarthritis, Gout, Acute Renal Failure, Chronic Renal Failure, Anemias, Epilepsy, Parkinsonism, Stroke.

ELECTIVE-VI (PHARMACEUTICAL QUALITY ASSURANCE)

General principles: Definition and concept of Quality control, Quality assurance and GMP; Total Quality Management (TQM): Definition, elements, philosophies; ICH Guidelines: purpose, participants, process of harmonization, ICH stability testing guidelines. Quality by design (QbD): Definition, overview, elements of QbD program, tools ISO 9000 & ISO14000: Overview, Benefits, Elements, steps for registration NABL accreditation: Principles and procedure

Good Laboratory Practices: General Provisions, Organization and Personnel, Facilities, Equipment, Testing Facilities Operation, Test and Control Articles, Protocol for Conduct of a Nonclinical Laboratory Study, Records and Reports, Disqualification of Testing Facilities.

Document maintenance in pharmaceutical industry: Batch Formula Record, Master Formula Record, SOP, Quality audit, Quality Review and Quality documentation, Reports and documents, distribution records.

Calibration and Validation: Introduction, definition and general principles of calibration, qualification and validation, importance and scope of validation, types of validation, validation master plan. Calibration of pH meter; Qualification of UV-Visible spectrophotometer; General principles of Analytical method Validation.

ELECTIVE-VII (CLINICAL PHARMACY)

Introduction to Clinical Pharmacy: Definition, evolution and scope of clinical pharmacy, International and national scenario of clinical pharmacy practice, Pharmaceutical care Clinical Pharmacy Services: Ward round participation, Drug therapy review (Drug therapy monitoring including medication order review, chart endorsement, clinical review and pharmacist interventions).

Clinical Pharmacy Services: Patient medication history interview, Basic concept of medicine and poison information services, Basic concept of pharmacovigilance, Hemovigilance, Materiovigilance and AEFI, Patient medication counseling, Drug utilization evaluation, Documentation of clinical pharmacy services, Quality assurance of clinical pharmacy services.

Patient Data Analysis: Patient Data & Practice Skills: Patient's case history - its structure and significances in drug therapy management, Common medical abbreviations and terminologies used in clinical practice, Communication skills: verbal and non-verbal communications, its applications in patient care services.

Medicines & Poison Information Services Medicine Information Service: Definition and need for medicine information service, Medicine information resources, Systematic approach in answering medicine information queries, Preparation of verbal and written response, establishing drug information Centre. Poison Information Service: Definition, need, organization and functions of poison information Centre.

Lab Data Interpretation: Tests associated with cardiac disorders, pulmonary function tests, Thyroid function tests, Fluid and electrolyte balance, Microbiological culture sensitivity tests