PHARMA OLYMPIAD SYLLABUS

FOR

PHARMA PROFESSIONAL/Ph.D SCHOLARS OLYMPIAD

P.R.S. EDUCATIONAL TRUST

BS-1202 & 1206, 12th Floor, Galaxy diamond Plaza,
Sector-4, Greater Noida (West), Gautam Buddh Nagar, U.P-201308

Pharma Olympiad Syllabus for Pharma Professionals/Ph.D Scholars

Research Methodology

Basics of Research-Definition, characteristics, types, need of research. Identification of the problem, assessing the status of the problem, formulating the objectives, preparing design (Experimental or otherwise), and actual investigation. Literature review-Importance of literature review, method and sources of literature review, review the literature selected, formulating the research problem based on extensive literature survey, developing the hypothesis, preparing the research design, development of a theoretical and conceptual framework, writing up the synopsis of the proposed Ph.D. program. Writing a Research Proposal-Research grant funding agencies, preparation of study protocols, preparing for application to funding agencies (Preamble, problem, objectives, hypothesis to be tested, design of study, measurement procedures, analysis of data, organization of report, displaying data tables, graphs, and charts). Data collection and Computer applications-Methods of primary and secondary data collection, selection of appropriate method of data collection. Use of word processing, spreadsheet and database software. Plotting of graphs. Internet and its application: E-mail, WWW, Web browsing, acquiring technical skills, drawing inferences from data. Research ethics, IPR and Scientific Communication: Ethics-ethical issues, ethical committees (human and animal); prewriting considerations, thesis writing, formats of report writing, preparing posters for scientific presentation, preparing, and delivering of oral presentation. Scholarly publishing-IMRAD concept and design of research paper, citation and acknowledgement, plagiarism, reproducibility and accountability, general consideration of IPR for patent drafting and submission. Introduction to statistics-Introduction to hypothesis, procedure for hypothesis testing, sample size, statistical tests of significance, parametric tests (students "t" test, ANOVA, correlation coefficient, regression), non–parametric tests (Wilcoxan rank tests, analysis of variance, correlation, chi-square test), null hypothesis, P-values, degree of freedom, interpretation of P-values. Communication skills-Meaning and importance of communication, objectives of communication, need for communication, types of communication, written and verbal communication language as a tool for communication, forms of technical communication.

Pharmaceutics

Introduction to pharmacokinetics-Pharmacokinetics models, physiological models, one compartment open model drug disposition, plasma elimination half-life, two compartment open model drug disposition. Drug Distribution-Apparent volume of distribution (one and two compartment models). Protein binding of drugs-Implications of drug protein binding in pharmacokinetics and therapy. Biotransformation of drugs-Phase-I and II biotransformation reactions and factors affecting biotransformation, Excretion of drugs-renal and non-renal drug excretion, mechanism of renal excretion, clearance by renal clearance, hepatic clearance, kinetics of drug absorption, one compartment model, evaluation of pharmacokinetic parameters. Dosage

form Evaluation-Bioavailability-Rate and extent of bioavailability, assessing bioavailability, multiple dosing bioavailability, in vitro bioavailability studies (dissolution), Bioequivalence-General principles, criteria for establishing bioequivalence requirement, criteria for waiver of evidence for bioequivalence requirement and methodology. Pharmacokinetics parameters-logarithmic transformations. Multiple dosage regimens-drugs accumulation, i.v. and oral regiment, loading dosing, scheduling. Diseases-dose adjustment–hepatic disease dose adjustment, renal disease dose adjustment, therapeutic drug monitoring. Non-compartment model pharmacokinetics-statistical movement theory, pharmacokinetics parameters. Concept & Models for NDDS-Classification of rate-controlled drug delivery system (DDS), rate programmed release, activation modulated & feedback regulated DDS. Fundamentals of rate-controlled drug delivery-Introduction, mechanistic analysis of controlled release drug delivery, effect of system parameters in controlled drug delivery, evaluation of controlled release drug delivery systems. Oral drug delivery and delivery systems-Development of novel drug delivery systems for oral controlled release drug administration, modulation of gastrointestinal transit time, overcome hepatic first pass elimination. Transdermal Drug Delivery systems-Skin site for transdermal drug administration, recent developments in transdermal drug delivery, fundamentals of skin permeation, technologies for developing transdermal systems, evaluation of transdermal systems, particulate drug carriers–liposomes and nanoparticles. Target Oriented Drug Delivery Systems-Rationale for targeted drug delivery, biological processes and events involved in drug targeting, pharmacokinetics and pharmacodynamics considerations, targeted drug delivery systems, targeting in the gastrointestinal tracts and other mucosal surfaces.

Biotechnology

Proteins and nucleic acids and their structure and features, genetic Engineering, enzymes and vectors in genetic engineering, concepts of cloning, cDNA and genomic libraries, cloning for production of biopharmaceuticals, screening and detection methods for clones. Recombinant DNA products and their applications, immune System- Innate and acquired immunity, monoclonal antibodies and immunological techniques. Basic techniques of mammalian cell culture in vitro; disaggregation of tissue and primary culture, maintenance of cell culture; cell separation, and applications of mammalian cell culture. Different areas and applications of plant tissue culture. Nutritional components of tissue culture media. Totipotency, Transgenic Plants and animals and their applications, Bioinformatics overview and applications.

Pharmaceutical Chemistry and Pharmaceutical Analysis

Structural Elucidation-Structural elucidation of natural, synthetic, and semisynthetic drugs by using spectroscopic data [UV, IR, H1NMR, C13 NMR, Mass]. Reaction Mechanisms: Generation, Stability, structure, and reactivity of free radicals, Carbocations and Carbines. Mechanism of free radical, electrophilic, Nucleophilic (Addition and substitution) reactions, elimination reactions with examples. Molecular Actions-Concept of receptors and receptor theories. The role of

functional groups in drug receptors, interactions with specific reference to opioid, dopaminergic, adrenergic, cholinergic and GABAnergic receptors. New drug development and lead approach: Identification of lead molecule for natural products. Lead optimization for the new drug development with suitable examples from CVS, CNS and chemotherapeutic agents. Drug Design: History and development of QSAR, physicochemical parameters. Hansch analysis, free klison analysis. Molecular modeling: Molecular mechanics quantum mechanism, docking, advanced concepts of molecular modeling. Miscellaneous-Design and application of prodrugs, structure-based drug design, combinational chemistry. Assays and screening combinational library's introduction to high throughputs screening (HTS). Instrumental Methods of Analysis- UV-Visible spectroscopy: Introduction, Beers law and its limitations, molar extinction coefficient, Woodward's Fiesher rules for calculating absorption maximum, instrumentation and applications. FTIR Spectroscopy- Principles-molecular vibrations, vibrational frequency and its influencing factors, sampling techniques, instrumentation, and applications of FTIR. NMR Spectroscopy-Principle, chemical shifts, shielding and deshielding effects, splitting of signals, computing constants, instrumentation and applications (H- & C-NMR). Mass spectroscopy- Principle, ionization Techniques, Fragmentation pattern, instrumentation and applications. GLC and HPLC: Principles, instrumentation with special emphasis on different column and detectors and applications. HPTLC, Ion-exchange Chromatography and Gel filtration: Principle, instrumentation and applications. Potentiometry and conductometry: Principle, instrumentation and applications. Polarimetry, fluorimetry and refractometry: Principle, instrumentation and applications with suitable examples.

Pharmacognosy

Basic concepts-General methods and Principles of extraction methods, types of extraction and their merits and demerits for crude drugs; selection and purification of solvents for extraction; screening of the plant extracts for chemicals. general methods of isolation of different classes of phytochemical. Screening and evaluation-Screening of plant extracts/phytochemicals for analgesic, anti-inflammatory, anti-diabetic, diuretic, anti-fertility, anti-epileptic, hepatoprotective, immunomodulatory, anticancer cardiovascular and antimicrobial activity. Techniques-Techniques employed in elucidation of bio synthetic pathway. Study of basic metabolic pathways (Shikimic, Acetate mevalonate pathway, calvin cycle), biogenesis of tropane, quinoline, imidazole, iso-quinoline and indole alkaloids; sterols, anthraquinone, saponin glycosides and flavonoids compounds of pharmaceutical significance. Current Scenario- Current status of anti-cancer, anti-HIV, anti-diabetic and Immunomodulatory herbal drugs. A review of biomedicines of recent discovery. Current status of plants used in alternative systems of medicines. Herbal formulations-Types of herbal formulations preparation of standardized extracts suitable for incorporation into solid dosage form like tablets, capsules etc. Recent trends in poly-herbal medicines. Herbal cosmetics and herbal teas. Manufacture, packaging and approach to quality control of herbal formulations. GMP for herbal drug formulations. Plant Tissue Culture- Current trends in tissue culture and its applications in pharmaceutical and allied fields. Immobilized cell

systems and techniques of immobilization, biotransformation resulting into pharmaceutically important secondary metabolites, using tissue cultures. Micro propagation, Hairy-root cultures and their applications in pharmacy.

Pharmacology

Pharmacokinetics-Processes involved in transportation of drug across cell membrane. Absorption, distribution, metabolism and excretion of drugs. Basic concepts of clinical pharmacokinetics-Bioavailability & bioequivalence, volume of distribution, half-life, clearance. Receptor Pharmacology and Mechanisms-Site and mechanisms of drug action, factors modifying drug action. classification and families of receptors, regulation of receptors, drug receptor interaction theories, dose response curve and therapeutic Index. Adverse drug reactions and drug Interactions: Types and mechanisms. Pharmacology of CNS and ANS acting drugs: Neurohumoral transmission, para-sympathomimetics, para-sympatholytics, sympathomimetics, sympatholytics, general anesthetics, sedatives, hypnotics and centrally acting muscle relaxants, anti-epileptics, antipsychotics, antidepressants, anti-anxiety agents, anti-manics and hallucinogens. Chemotherapy-General principles of chemotherapy, sulfonamides and cotrimoxazole, antibiotics (Penicillins, cephalosporins, chloramphenicol, macrolides, quinolones and fluoroquinolins, tetracycline and aminoglycosides), antitubercular agents, antileprotic agents, antifungal agents, antiviral drugs, antimalarial drugs and chemotherapy of malignancy. Cardiovascular pharmacology-Cardiotonics, antiarrhythmics, antihypertensive, antianginal and antihyperlipidemic agents. Endocrine Pharmacology- Anterior pituitary hormones, thyroid hormones, hormones regulating plasma calcium level, ACTH and corticosteroids, insulin, oral hypoglycemic agents and glucagon.