


KUVEMPU UNIVERSITY
Post Graduate Centre, Kadur
DEPARTMENT OF PHARMACEUTICAL CHEMISTRY

Entrance Examination for Ph.D. Admissions 2023-2024

LIST OF THE STUDENTS APPLIED FOR Ph.D., PROGRAMME IN PHARMACEUTICAL CHEMISTRY
FOR THE ACADEMIC YEAR - SEPTEMBER- 2024

Sl. No.	Name	Register No.
01	AJAY KUMAR N.	PC202401
02	BHARATH KUMAR K.	PC202402
03	KAVYASHREE K.C.	PC202403
04	SINDHUSHREE K. L.	PC202404
05	SHASHIKALA M. A.	PC202405

INSTRUCTIONS

Date of Entrance Examination: 25-09-2024 (Wednesday)

Time: 10.30 A.M. to 1.30 P.M.

Venue: Department of Pharmaceutical Chemistry, Kuvempu University, P. G. Centre, Kadur.

- Maximum Marks for Entrance Examination: 90
- Duration of Entrance Examination: 3 hours.
- Question Paper pattern:
 - Part A: 20 multiple choice questions each carrying one mark. (20x1=20)
 - Part B: 05 out of 08 questions to be answered. Each question carries 06 marks. (05x06=30)
 - Part C: 04 out of 06 questions to be answered. Each question carries 10 marks. (04x10=40)
- Syllabus for Entrance Examination: Research Methodology and Cognate Subjects of Pharmaceutical Chemistry
- The candidates willing to appear for Entrance Test should collect their Hall Ticket from the office, between 10 A.M. to 5 P.M. on or before 24.09.2024 (Tuesday).
- The candidates should bring a passport size photograph to affix to the Hall Ticket.

CHAIRMAN

Phone No. 08267-295091/ Mobile: 9740484017

SYLLABUS FOR ENTRANCE EXAMINATION

Time: 3 hours.

Part – A Research Methodology

Selection of research problems and literature survey: primary sources- Journals periodicals, abstracts; Secondary listing of titles, reviews – annual Treatise, serials, monographs and text book, encyclopedia, catalogues, index of tabulated data-science citation index- searching the chemical literature-location of journal article-materials on a given topic-information about specific compound-choosing a problem-abstract of a research paper. Internet: Introduction to internet-web browsers-world wide web-search engines-literature survey in chemistry-popular website in chemistry/pharmaceutical chemistry-Database in pharmaceutical chemistry. E-mail: introduction to e-mail-creation of e-mail-Receiving and sending e-mail. Patent: Introduction, patentable subject, steps involved in patenting.

Purification of compounds: General Methods of isolation and purification of chemicals, Solvent extraction both cold and hot methods of crystallization, fractional crystallization, sublimation, Distillation; fractional distillation, distillation under reduced pressure, steam distillation, drying methods of solvents. Handling of chemicals, hazardous chemicals air/water sensitive, corrosive, toxic, explosive, carcinogenic and radioactive materials. Safety measures in laboratory, Good laboratory practices (GLP).

Error Analysis in Chemical Measurements and results: Classification of errors-Accuracy-Precision-Minimization of errors-Significant figures. Statistical treatment of data: Mean and Standard Deviation-distribution of random and normal errors-Reliability of results-Confidence interval-Comparison of mean results students t-distribution and t-tests-Comparison of precision of two methods, comparison of precision of two methods- Linear regression, regression line, standard deviation, correlation coefficient-Multiple linear regression (one variable with two other variables).

Product development strategy: Product development process and its evaluation; opportunity identification use of breakdown structure; concept generation and its evaluation, concept generation techniques, concepttesting; Constitution of team organization structure, cross functional team: Technical development quality function deployment, project planning techniques, Gantt charts, mile stone chart, pERT and CpM network analysis product validation; market planning, test marketing, pricing, promotion, positioning and distribution, evaluation of market feedback; environmental concerns; intellectual property - patent protection

Part-B Cognate Subject

Pericyclic Reactions: Molecular orbital symmetry, Frontier orbital of ethylene,1,3- butadiene, 1,3,5-hexatriene and allyl system, classification of pericyclic reactions.Woodward- Hofmann correlation diagrams. FMO and PMO approach, Electrocyclic reactions, conrotatory and disrotatory motions, $4n$, $4n+2$ systems, $2+2$ addition of ketenes.1,3-Dipolar cycloadditions and cheletropic reactions. Sigmatropic rearrangements-suprafacial and antarafacial shifts of hydrogen, sigmatropic shifts involving carbon moieties, 3,3 and 5,5 sigmatropic rearrangements, Claisen, Cope and aza-Cope rearrangements.

Photochemistry: Laws of photochemistry, quantum yield, factors affecting quantum yield, Jablonski diagram, bonding and antibonding orbitals, singlet and triplet states, relative energies of excited state. Photoreduction of ketones, photooxidation, photisomerisation, photosensitization.Photolysis-Norrish type-I and type-II reactions. Di-pi-methane rearrangement. Paterno-Buchi reaction and photochemistry of arenes.

Chemistry of Heterocyclic Compounds: synthesis and chemical reactions of Pyrrole, Furan, Thiophene, Pyridine,Indole, benzofuran, benzothiophene, quinoline and isoquinoline.

Molecular Rearrangements: Classification and general mechanistic treatment of nucleophilic, electrophilic and free radical rearrangements: A] Rearrangements involving migration to electron deficient carbon: Wagner-Meerwein, Pinacol-Pinacolone, Wolff, benzil-benzilic acid rearrangements. B] Rearrangements involving migration to electron deficient nitrogen: Beckmann, Hoffmann, Curtius, Lossen and Schmidt rearrangements. C] Rearrangements involving migration to electron deficient oxygen: Bayer-villiger oxidation, Dakin reaction and hydroperoxide rearrangements. D] Rearrangements involving migration to electron rich carbon: Fevorskii, Sommelet-Houser, Naber rearrangements. E] Aromatic Rearrangements: Fries, and Claisen rearrangements

Spectroscopy: Instrumentation, principles, concepts and rules of UV, IR, NMR and Mass spectrometry.

Separation Science: Paper, TLC, Column, HPLC, GC and hyphenated Techniques.

Reagents in Organic reactions: Application of following reagents in Organic reactions. Dicyclohexylcarbodiimide (DCC). Lead tetraacetate (LTA). Osmium tetroxide. DDQ. Selenium dioxide. Phase transfer catalyst. Ionic liquids. N-Bromosuccinamide. Wilkinson's Catalyst. Diazomethane, Fentons reagent, Boron Trifluoride, Anhydrous AlCl₃, Hydrogen Peroxide, LAH, Periodic acid, Raney Nickel, NaNH₂, NaBH₄, Gillmanns reagent, LDA, 1,3 dithiane and 9-BBN, Ziegler-Natta Catalyst.

Named Reactions: Mechanism and applications of Aldol, Perkin, Stobbe, Dickmann condensations, Riemer-Tiemann and Reformatsky reactions, Diels-Alder reaction, Friedel Craft's reaction, Wittig reaction, Micheal addition, Robinson annulation, Oppenaur oxidation, Clemmensen, Wolf-Krishner, Meerwein-Varley-Ponndorf and Birch reduction, Stork enamine, Mannich reaction, Sharpless asymmetric epoxidation, Ene reaction, Barton reaction, Hofmann-Löffler-Freytag reaction, Shapiro reaction, Baer-Villiger reaction, Chichibabin reaction.

Stereochemistry: Concept of chirality; symmetry elements and chiral structures, Absolute configurations-D, L & R, and S nomenclature. Enantiomers, Epimers, Anomers, Racemic mixtures, Resolution. Diastereomers- in cyclic and acyclic systems, Optical activity in the absence of chiral carbon – Biphenyls, allenes, and spiranes. Cis-trans, syn-anti and E,Z, notations for geometrical isomers. Determination of configuration (physical and chemical methods). Conformational analysis of simple acyclic systems (butane, 1,2-dichloroethane) and acyclic systems (Chair and boat forms of cyclohexane). Effect of conformation on reactivity in acyclic and cyclic systems Chiral technology: Introduction, Aminoacylase bioresolution of N-acyl amino acids, Asymmetric hydrogenation of prochiral olefins by rhodium-Duphos catalyst, Asymmetric hydrogenation of prochiral ketones by ruthenium-biphosphin-diamine catalyst, Asymmetric hydroformylation with rhodium phosphate catalyst

Chemistry of amino acids and peptides: Amino acids: Introduction, classification, isoelectric point. Synthesis of amino acids-Streckers synthesis, Gabriel phthalimide synthesis. Erlinmeyers synthesis, Knoop synthesis. Chemical reaction of alpha amino acids: reactions involving a) amino group b) carboxylic acid and c) both carboxylic and amino group. Peptides: Introduction, peptide linkage, Major methods of peptide synthesis: synthesis of following di and tri peptides by using Merrifield resin. a) gly-gly b) gly-ala c) gly-val d) gly-glygly e) gly-ala-ala f) ala-ala-gly. stereochemistry features and confirmation features. Determination of primary structure of protein. Blocking agents and deblocking agents used in amino group protection and de protection. Reagents and reaction used in activation of carboxylic group of amino protected amino acids

Natural Products and Nucleic acids A) Alkaloids: Introduction, Occurrence, Structure elucidation and synthesis of following Alkaloids: Morphine, Nicotine, papaverine. Phytochemical tests for alkaloids. Glycosides: Introduction, General characters and classification of glycosides. Study of general methods of isolation and uses of the following: Cardiac glycosides, Anthracene glycosides and Cyanogenetic glycosides. Anthocyanins: Introduction, general nature of anthocyanin. Occurrence, structure and synthesis of anthocyanins and Flavones. Phytochemical tests for flavonoids. B) Nucleic acids: Classification of nucleic acids, structure of nucleosides, nucleotides and nucleic acids, nucleosides containing pyrimidine and purine bases, sequence of nucleic acids, Crick-Watson model of DNA, structure of RNA (m-RNA, t-RNA and rRNA).

Medicinal Chemistry-I: Synthesis and SAR of nitrofurazone and furazolidone Sulfonamides: Introduction, classification, mechanism of action, Synthesis and SAR of sulfisoxazoles and sulfamethoxazoles Antibiotics: Introduction, classification, mechanism of action, Synthesis and SAR of Penicillin G, cephalosporins, and

tetracyclins. Antitubercular and antileprotic agents: Introduction, classification, mechanism of action, Synthesis of isoniazid, ethambutal, clofazimine, dapsone. Analgesic and anti-inflammatory agents: Introduction, classification, mechanism of action, Synthesis of Ibuprofen, phenylbutazone, acetaminophen, diclofenac sodium. Anticancer/antiviral, hypoglycemic agents: Introduction, classification, mode of action, Synthesis of 5-fluorouracil, azidothymidine, Tolbutamide and tolazamide

Antimalarials: Introduction, classification, mechanism of action, Synthesis of Chloroquine, mefloquine, primaquine. SAR of antimalarial agents. Antiamoebic agents: Introduction, classification, mechanism of action, Synthesis of Metronidazole and iodoquinol Anticonvulsant: Introduction, classification, mechanism of action, Synthesis of Phenytoin sodium, carbamazepine. Sedatives and hypnotics: Introduction, classification, mechanism of action, Synthesis of Phenobarbital, Chlordiazepoxide General anesthetics: Introduction, classification, mechanism of action, Synthesis of Halothane, Methohexital sodium

Antihistamine: Introduction, classification, mode of action, Synthesis of Pheniramine maleate, pyrilamine, ranitidine, cimetidine Cardiovascular Agents: Introduction, classification, mechanism of action, Synthesis of Antiarrhythmic agents verapamil, Antihypertensive agent clonidine and hydralazine derivatives Psychopharmacological agents: Introduction, classification, mechanism of action, Synthesis of Benzodiazepines: diazepam, Phenothiazines: chlorpromazine, Amitriptyline.

Medicinal chemistry-II: SAR and QSAR: SARs, Changing size and shape, introduction of new substituents-the introduction of a group in an unsubstituted position, the introduction of a group by replacing the existing group. QSAR- Lipophilicity, partition coefficient ($\log P$), lipophilic substitution constants (π). Electronic effect (Hammett constant σ), steric effect, Taft's steric parameter (E_s), Hansch analysis and application, Craig's plot, Free-Wilson analysis and application

Selective examples of drug action at some common target areas: Introduction, Examples of drugs that disrupt cell membranes and walls-Antifungal agents, Azoles, Allylamines, Phenols, Antibacterial agents- Ionophoric antibiotic action, Cell wall synthesis inhibition, Drugs that target enzymes Reversible inhibitors, Irreversible inhibition, Transition state inhibitors, Drugs that target receptors Agonists, Antagonists, Partial agonists. Drugs that target nucleic acids- Antimetabolites, Enzyme inhibitors, Intercalation agents, Alkylating agents, Antisense drugs, Chain cleaving agents, Antiviral drugs-Nucleic acid synthesis inhibitors, Host cell penetration inhibitors, Inhibitors of viral protein synthesis

Combinatorial Chemistry and Drug metabolism: Introduction, the design, general techniques used in combinatorial synthesis, the solid support method, parallel synthesis, Furka's mix and split techniques, Encoding methods-Sequential chemical tagging method, stills binary core tag system, computerized tagging, combinatorial synthesis in solution, screening and deconvolution. Drug metabolism: Introduction, sites of drug biotransformation, Phase-I and phase-II reactions, role of Cytochrome P-450, Factors affecting drug metabolism

General pharmacology: Screening methods, antiulcer, anti-implantation, analgesic and anti-inflammatory. Drug receptor Interaction and Adverse Drug receptor, Immunology and Microbiology.

Dosage forms and regulations, Stability of medicinal products, Novel Drug Delivery Systems, Current good manufacturing practice.
