



POST-GRADUATE CENTRE, KADUR
Department of Pharmaceutical Chemistry

Syllabus for Ph.D. Entrance Examination-2022

SECTION A: RESEARCH METHODOLOGY

UNIT-I: Research sources: Selection of research problems and literature survey: primary sources- Journals periodicals, abstracts; Secondary listing of titles, reviews –annual Treatises, serials, monographs and text books, 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-Database in chemistry.

E-Mail: Introduction to e-mail- creating e-mail-Receiving and sending e-mail.

Patent: Introduction, patentable subject

UNIT-II: Purification and safety measures: 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)

UNIT-III: 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 mean with expected value, comparison of the results of the two different methods, comparison of precision of two methods- Linear regression, regression line, standard deviation, correlation coefficient – Multiple linear regression (one variable with two other variables).

UNIT-IV: Research manuscript preparation Full length research paper, short communication, letters, reviews, popular science articles in magazines, few case studies with reference to journals and periodicals. Presentation of research papers: Oral and poster presentation in seminars, workshops and conferences etc. Preparation of synopsis and thesis, Preparation of research project proposals.

UNIT-V: Product development strategy: Product development process and its evaluation; opportunity identification use of breakdown structure; concept generation and its evaluation, concept generation techniques, concept testing; 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.

SECTION B :PHARMACEUTICAL CHEMISTRY

UNIT-I: Reactions, rearrangement and Reagents:

Reactions/Rearrangement: Aldol condensation, Baeyer- Villiger rearrangement, Mannich reaction, Oppenauer oxidation, Reformatsky reaction, Wittig reaction, Wolf rearrangement, Michael addition reaction, Diels-Alder reaction, Reimer-Tiemann reaction.

Reagents: DDQ, Dicyclohexyl carbodiimide (DCC), Osmium tetroxide, Lithium diisopropyl amide (LDA), 1,3-Dithiane, crown ether, Stannic chloride, Peterson synthesis, and Baker's yeast.

UNIT-II: Heterocyclic compounds: Synthesis and reactivity of furan, pyrrole, benzofuran, indole, quinoline, isoquinoline and pyrimidine.

UNIT-III: Separation techniques: Introduction, principles and applications of paper chromatography, Thin layer chromatography, column chromatography, gas chromatography, high performance liquid chromatography, electrophoresis. Introduction, instrumentation and application of hyphenated techniques (LCMS, GCMS).

UNIT-IV: Spectroscopic techniques:

Introduction, Instrumentation, Principle and applications of UV, IR, NMR [^1H and ^{13}C ,] quantum description of NMR, chemical shift, spin-spin coupling, coupling constant] and mass spectrometry in structural elucidation of organic compounds. Problems on structural elucidation involving all the above spectroscopic methods.

UNIT-V: Drug Physicochemical properties and Drug metabolism

Drug action, Drug therapy, Drug receptor interaction, Physicochemical properties in relation with biological activity.

Drug metabolism: General Pathways of drug metabolism (Phase I and Phase II pathways), role of Cytochrome P450 in drug metabolism, sites of drug biotransformation, factors affecting drug metabolism.

UNIT-VI: Medicinal Chemistry: Introduction, synthesis and mechanism of action of Antibiotics (penicillin G), Sulfonamides (sulfisoxazole), Antimalarials (chloroquine), Antiamoebic agents (metronidazole), analgesic and anti-inflammatory (Ibuprofen), Hypoglycemic agents (Tolbutamide), antiarrhythmic agent (Verapamil), Antihistaminic agent (ranitidine), Antileprotic agent (Dapsone), Sedative and hypnotic (diazepam).

UNIT-VII: Bioorganic Chemistry: Prodrugs, utility of prodrugs, types of prodrugs(carrier linked and bioprecursor), combinatorial chemistry, Chemistry of Natural Prodrugs (synthesis and uses of Morphine, Papavarine, Cardiac glycosides, Flavonoides, Anthocyanins, terpenoids, Steroids and Saponins).

UNIT-VIII: Classification, Characteristics of enzymes, enzyme substrate complex. Concept of active centre, binding sites, stereospecificity and ES complex formation. Effect of temperature, pH and substrate concentration on reaction rate. Activation energy. Transition state theory. *Enzyme Kinetics:* Michaelis - Menten Equation - form and derivation, steady state enzyme kinetics. Significance of V_{max} and K_m . Bisubstrate reactions.

Enzyme inhibition-Overview of enzymes as catalytic receptors, types of inhibitors - competitive, noncompetitive and uncompetitive, their mode of action. Isoenzymes, General concept of enzyme inhibition-reversible enzyme inhibition eg. Azidothymidine, physostigmine and 5-fluorouracil, Irreversible enzyme inhibition- Affinity labels and active site directed irreversible enzyme inhibitors-TPCK, mechanism based irreversible enzyme inactivators - Clavulanic acid and Gabaculin.

UNIT-IX: Chemistry of amino acids and peptides: *Amino acids:* Introduction, classification, isoelectric point. Synthesis of amino acids-Streckers synthesis, Gabriel phthalamide 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-gly-gly 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.

UNIT-X: 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.