Center of Excellence in Pharmaceutical Sciences
Guru Gobind Singh Indraprastha University
("A State University established by Govt. of NCT of Delhi")
Sector 16-C, Dwarka, New Delhi-110 078

Offline applications are invited for regular full-time PhD Programme in Pharmaceutical Chemistry at Center of Excellence in Pharmaceutical Sciences (CEPS).

1. Common minimum eligibility criteria for admission to Ph.D. Programme:

1.1 Candidates seeking admission to the Ph.D. programme should have completed a 1-year/2semester master's degree programme after a 4-year/8-semester bachelor's degree programme, with at least 55% marks in aggregate or its equivalent grade in a point scale wherever grading system is followed.

OR

Candidates seeking admission to the Ph.D. programme should have completed a 2-year/4semester master's degree programme after a 3-year bachelor's degree programme or qualifications declared equivalent to the master's degree by the corresponding statutory regulatory body, with at least 55% marks in aggregate or its equivalent grade in a point scale wherever grading system is followed.

OR

Candidates seeking admission after a 4-year/8-semester bachelor's degree programme should have a minimum of 75% marks in aggregate or its equivalent grade on a point scale wherever the grading system is followed.

OR

Candidates who have completed the M.Phil. programme with at least 55% marks in aggregate or its equivalent grade in a point scale wherever grading system is followed shall be eligible for admission to the Ph.D programme.

OR

Candidates who have an equivalent qualification from a foreign educational institution accredited by an assessment and accreditation agency which is approved, recognized or authorized by an authority, established or incorporated under a law in its home country or any other statutory authority in that country to assess, accredit or assure quality and standards of the educational institution shall be eligible for admission to Ph.D. programme.

1.2 In cases where the marks of the qualifying examination are not given by the degree awarding recognized University/ Institution, such as in case of M.D.S., M.D., M.S., D.M., M.Ch. etc,

candidates, who have obtained a minimum of 55% marks in aggregate or its equivalent grade in a point scale wherever the grading system is followed, in the relevant Undergraduate Examination, shall be considered eligible to seek admission to the Ph.D. Programme. In such cases, the concerned candidates shall be required to submit an undertaking that their University/ Institution does not give marks for the said qualifying examination.

1.3 A relaxation of 5% marks or its equivalent grade may be allowed for those belonging to SC/ST/OBC (non-creamy layer)/Differently-abled/Economically Weaker Section (EWS) and other categories of candidates as per the decision of the Commission from time to time.

* **Number of available Ph.D. slots:** The final Ph.D. slots for academic session 2025-26 will be notified on university website by CEPS before schedule of exam.

* The eligibility criteria and procedure for admission as specified in this admission brochure are subject to changes made in the ordinances, rules and regulations by the University from time to time as per the decision of university and/or statutory bodies governing various programmes. The reservation policy shall be implemented in accordance with the Govt. of India and Govt. of NCT rules as applicable.

2. Additional Eligibility Criteria:

M.Pharm./ M.S.(Pharm.) (Pharmaceutical Chemistry/Medicinal Chemistry/Natural Products/ Pharmaceutical Analysis/Quality Assurance); M.Tech. (Pharm.) (Bulk Drugs/Process Chemistry); M.Sc. (Medicinal chemistry and Drug Design), M.Sc. (Bioinformatics) with at least 55% marks in aggregate or its equivalent grade in a point scale wherever grading system is followed.

The Entrance Test syllabus shall consist of 50% of research methodology and 50% shall be subject specific. Students who have secured 50% marks in the entrance test are eligible to be called for the interview.

University may decide the number of eligible students to be called for an interview based on the number of Ph.D. seats available in the respective departments/ approved research centres.

Provided that for the selection of candidates a weightage of 70% for the Academic Performance Index and 30% for the performance in the interview / viva-voce shall be given.

3. Interview Criteria* (At least any one of the following)

1. Qualified in PET

2. Qualified and Valid GATE/GPAT Score.

3. Candidates who have already cleared any of the National Test for the eligibility of lectureship like UGC/ CSIR NET including JRF, GATE, CSIR, DST, DBT, ICMR etc, or any other prestigious test for National level scholarship / fellowship conducted by Govt. of India.

SYLLABUS

PHARMACEUTICAL CHEMISTRY

Part A – 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, methods, 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.

Data representation: Collection of data, Tabulation, Organization and graphical representation of quantitative data: Line Graphs, Bar Graphs, Pie Charts, Histograms; Probability concept and theories.

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).

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.

Probability and Distributions: Sample space, events, Equally likely events. Probability and types; Different Approaches, Independent Events, Addition and multiplication rules, Rules for Calculating Probabilities. Hypothesis testing: Null hypothesis, Alternate hypothesis, Steps of hypothesis testing, Level of significance, Type I and Type II error.

Analysis of Variance and Testing Hypothesis: 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.

Part B– Pharmaceutical Chemistry (Subject Specific Test)

UV-Visible Spectroscopy: Introduction, Beers law and its limitations, molar extinction coefficient, Woodward's Fiesher rules for calculating absorption maximum, instrumentation, and applications, Rule for 1,3- butadienes, cyclic dienes and, carbonyl compounds and interpretation compounds of enones. ATR-IR, IR Interpretation of organic compounds.

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, instrumentations, and applications (H- & C-NMR). 1-D and 2-D NMR, NOESY and COSY, HECTOR, INADEQUATE techniques, Interpretation of organic compounds.

Mass Spectroscopy: Principle, ionization Techniques, Fragmentation pattern, instrumentation, and applications. Mass fragmentation and its rules, Fragmentation of important functional groups like alcohols, amines, carbonyl groups and alkanes, Meta stable ions, Mc Lafferty rearrangement, Ring rule, Isotopic peaks, Interpretation of organic compounds.

GLC and HPLC: Principles, instrumentation with special emphasis on different columns 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.

Thermal methods of analysis: Introduction, principle, instrumentation and application of DSC, DTA and TGA. Radioimmunoassay Biological standardization, bioassay, ELISA, Radioimmunoassay of digitalis and insulin.

Chromatography: Principle, apparatus, instrumentation, chromatographic parameters, factors affecting resolution, isolation of drug from excipients, data interpretation and applications of the following: TLC, HPLC, Ion exchange chromatography, Column chromatography, Gas chromatography, Ultra High-Performance Liquid chromatography, Affinity chromatography and Gel Chromatography.

Study of mechanism and synthetic applications of following named Reactions Ugi reaction, Brook rearrangement, Ullmann coupling reactions, Dieckmann Reaction, Doebner-Miller Reaction, Sandmeyer Reaction, Mitsunobu reaction, Mannich reaction, Vilsmeyer-Haack Reaction, Sharpless asymmetric epoxidation, Baeyer-Villiger oxidation, Shapiro and Suzuki reaction, Ozonolysis and Michael addition reaction

Heterocyclic Chemistry: Organic Name reactions with their respective mechanism and application involved in synthesis of drugs containing ve, six membered and fused hetrocyclics

such as Debus Radziszewski imidazole synthesis, Knorr Pyrazole Synthesis, Pinner Pyrimidine Synthesis, Combes Quinoline Synthesis, Bernthsen Acridine Synthesis, Smiles rearrangement and Traube purine synthesis.

Green Chemistry: Introduction, principles of green chemistry; Working principle, advantages and synthetic applications of Microwave assisted reactions, Ultrasound assisted reactions, Continuous flow reactors.

Chemistry of peptides: Coupling reactions in peptide synthesis, Principles of solid phase peptide synthesis, t-BOC and FMOC protocols, various solid supports and linkers: Activation procedures, peptide bond formation, deprotection and cleavage from resin, low and high HF cleavage protocols, formation of free peptides and peptide amides, puri cation and case studies, site-specific chemical modifications of peptides.

Stereochemistry & Asymmetric Synthesis: Basic concepts in stereochemistry optical activity, specific rotation, racemates and resolution of racemates, the Cahn, Ingold, Prelog (CIP) sequence rule, meso compounds, pseudo asymmetric centres, axes of symmetry, Fischer's D and L notation, cis-trans isomerism, E and Z notation; Methods of asymmetric synthesis using chiral pool, chiral auxiliaries and catalytic asymmetric synthesis, enantiopure separation and Stereo selective synthesis with examples.

Synthesis of few representative drugs containing these hetrocyclic nucleus such as Ketoconazole, Metronidazole, Miconazole, celecoxib, antipyrine, Metamizole sodium, Terconazole, Alprazolam, Triamterene, Sulfamerazine, Trimethoprim, Hydroxychloroquine, Quinine, Chloroquine, Quinacrine, Amsacrine, Prochlorperazine, Promazine, Chlorpromazine, Theophylline, Mercaptopurine and Thioguanine.

Synthon approach and retrosynthesis applications: Basic principles, terminologies and advantages of retrosynthesis; Drug discovery: Stages of drug discovery, lead discovery; identification, validation and diversity of drug targets. Biological drug targets: Receptors, types, binding and activation, theories of drug receptor interaction, drug receptor interactions, agonists vs antagonists, artificial enzymes.

Prodrug Design and Analog design: Prodrug design: Basic concept, Types of prodrugs, and its applications. Rationale of prodrug design and practical consideration of prodrug design; Analog Design; Bioisosterism.

Medicinal chemistry aspects of the following class of drugs: Anti-hypertensive drugs, Psychoactive drugs, Anticonvulsant drugs, Antihistamine drugs, COX1 and COX2 inhibitors, Adrenergic and Cholinergic agents, Antineoplastic and Antiviral agents; Stereochemistry and Drug action; Case studies, Enantioselectivity in drug adsorption, metabolism, distribution and elimination.

Peptidomimetics: Therapeutic values of Peptidomimetics, design of peptidomimetics by manipulation of the amino acids, modification of the peptide backbone, incorporating

conformational constraints locally or globally. Chemistry of prostaglandins, leukotrienes and thromboxones.

Study of Natural products as leads for new pharmaceuticals for the following class of drugs: Drugs Acting the Central Nervous System: Morphine, Alkaloids; Anticancer Drugs: Paclitaxel and Docetaxel, Etoposide, and Teniposide; Cardiovascular Drugs: Lovastatin, Teprotide and Dicoumarol. d) Neuromuscular Blocking Drugs: Curare alkaloids; Anti-malarial drugs and Analogues; Chemistry of macrolide antibiotics (Erythromycin, Azithromycin, Roxithromycin, and Clarithromycin) and- Lactam antibiotics (Cephalosporins and Carbapenem).

General introduction, classification, isolation, puri cation, molecular modification, biological activity and structural elucidation and stereochemistry of alkaloids, flavonoids, Steroids, Terpenoids and vitamins. Recombinant DNA technology and drug discovery rDNA technology, hybridoma technology, new pharmaceuticals derived from biotechnology; Oligonucleotide therapy.

Introduction to Computer Aided Drug Design (CADD): QSAR, Applications of Hansch analysis, Free Wilson analysis and relationship between them, Advantages and disadvantages; Deriving 2D-QSAR equations. 3D-QSAR approaches and contour map analysis. Statistical methods used in QSAR analysis and importance of statistical parameters.

Molecular Modeling and Docking: Molecular and Quantum Mechanics in drug design; Energy Minimization Methods, Rigid docking, flexible docking and extra-precision docking; Agents acting on enzymes such as DHFR, HMG-CoA reductase and HIV protease, choline esterase (AchE & BchE).

Molecular Properties and Drug Design: Prediction and analysis of ADMET properties and its importance in drug design, De novo drug design, Homology modeling and generation of 3D-structure of protein. Pharmacophore Mapping and Virtual Screening, In Silico Drug Design and Virtual Screening Techniques.

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Sector-16-C, Dwarka, New Delhi-110078

[Website: www.ipu.ac.in]

Passport size Photograph

Application Form for Admission in Ph.D Programme (2025-26)

1. Name of the Programme:
2. Name of the University Centre:
3. Name of the Candidate:
4. Father's Name:
5. Mother's Name:
6. Date of Birth (DD/MM/YY):
7. Nationality:
8. Category (GEN/OBC/SC/ST/EWS):
9. Email & Mobile No.:
10. Religion:
11. Gender:
12. Visible Mark of Identification:
13. Whether Passed or Appearing in the Qualifying Exam (Passed / Appearing) Passing Year:
14. Permanent address:
15. Correspondence address:
16. Qualified any National level Test (Attached documents):
17. Educational Qualification (Attached documents):

S.No.	Standard	Board/ University Name	Board/ University Roll No.	Subjects	Max. marks	Marks Obtained	Result Status Appearing/ Passed	% of marks

18. Details of Fee Paid*:

DD No.	Date of DD	Amount	Drawn on

19. Present Occupation/Employment:

(Give Name and Address of the Employer)

20. Details of Teaching/Industry Experience:

21. Particulars of Publications (If any):

22. Professional Experience (Start from the present employment)

Sl. No	Organization	Period		Designation	salary P/M	Nature of job
		From	To			

DECLARATION OF THE CANDIDATE: I hereby declare that the above information filled by me is true and correct as per my knowledge and belief. I understand that if above information or attached documents are found false, incorrect or incomplete, I can be debarred from admission proceedings at any stage or after the admission. I further understand that no notice period shall be taken on request for withdrawal of my application.

Place:

Date: Signature of the candidate

Undertaking from result awaited candidates for seeking provisional admission for academic session 2025-26.

I/My Ward _____ (Name of the candidate), Son/Daughter/Wife of _____(Father's/Husband's name), Application No/PET Application No _____ and Rank _____ Resident _____ (Permanent Address) seeking admission to _____ Name of the Programme of GGSIP University, hereby solemnly affirm and declare:

i) that I/My ward have/has appeared in the (name of the qualifying degree) _____ Examination, 2025 of (Board/University) during the time of reporting in allotted College/ Institute, the result of which has not yet been declared and is expected to be declared latest by 31st October, 2025;

ii) ii) I have passed all the papers of the qualifying degree _____ (name of the qualifying degree) examination other that the final year /final semester examination.

iii) I have no compartment as on this date in the qualifying degree examination.

iv) I am seeking provisional admission due to non-declaration of result of final year/final semester of the qualifying degree examination by University and not on account of compartment in current or previous years of the qualifying degree examination as on date of admission.

v) That I/My ward have/has carefully gone through the rules regarding provisional admission and fully understand that in the event of my/my ward's failure to submit to the concerned Dean/Director of the concerned School/Centre where the admission has been granted, appropriate proof of my/my ward securing at least _____ marks in the qualifying examination for admission to _____(Name of the Course) of GGSIP University by 31st October, 2025, my/my wards provisional admission to the said course will automatically get cancelled and full fee deposited will be forfeited.

Deponent

Deponent Verification: Verified at _____ on this _____ day of _____, 2025 that the contents of the above Undertaking are true and correct to the best of my knowledge and belief. No part of it is false and nothing material has been concealed therefrom.

Deponent

Please note: Submission of false Undertaking is a punishable offence. If it is found at any stage that false Undertaking was submitted, admission shall be cancelled and legal proceedings shall be initiated, for which candidate/parent/guardian shall be responsible.