UNIVERSITY OF LUCKNOW
MASTERS OF PHARMACEUTICAL CHEMISTRY PROGRAMME
REGULATION 2020

Applicability

These regulations shall apply to the Masters in Pharmaceutical Chemistry programme from the session 2020-21.

2. Minimum eligibility for admission

A three/four years Bachelor's degree or equivalent with chemistry as one of the subject in final year awarded by University or Institute established as per law and recognized as equivalent by university with minimum 45% marks for general and OBC (SC/ST 40%) or equivalent grade shall constitute the minimum requirement for admission to the Masters in Pharmaceutical Chemistry Programme

3. Programme Objectives

i. To enable the students to understand the basic concepts of bio-inorganic, bio-organic, physical chemistry, analytical chemistry, drug formulation, drug design and development.
ii. To develop the ability to present pharmaceutical chemistry research by means of an oral presentation, a scientific poster or a written report.
iii. To be able to use and apply professional softwares relevant to chemistry.
iv. To equip the students with the knowledge to develop Pharmaceutically important molecules, new drug delivery systems etc.
v. To learn the application of analytical tools for determination of organic molecules and to generate validation protocol for all pharmaceutical operations starting from drug research to development to formulation.
vi. To learn the Mechanism of Action of various class of drugs.
vii. To learn the brief overview of the use of various drugs in treatment of various diseases.

4. Programme Outcomes

PO-1. Demonstrate, solve and an understanding of major concepts in all disciplines of Chemistry independently and in group as well as draw logical conclusions through Project and Seminar Presentation.
PO-2. Encourage students to make critical thinking and the scientific knowledge gained would help them to design, carry out, record and analyze the results of Chemistry as well pharmaceutical experiments.
PO-3. Equip students to face the employment challenges and instil confidence to turn into entrepreneur and also step into research career.
PO-4. Generation of new scientific insights or to the innovation of new applications of chemical research
PO-5. Present scientific and technical information resulting from laboratory as well as Industrial/pharmaceutical experimentation in both written and oral formats, would make them perfect.
PO-6. Learns modern methods of chemical systems in a laboratory setting make them perfect for any scientific laboratory and industry.
PO-7. The students will become well versed in the mechanisms and also with the mode of action of drugs.
PO-8. The present course content will build confidence in students and the students will improve their competencies on par with their counterparts in premier institutions across the nation.

5. Programme Specific Outcomes

PSO-1. Students will be able to understand the basic concepts of bio-inorganic, bio-organic, physical chemistry, analytical chemistry, drug formulation, drug design and development, and green chemistry
PSO-2. Students will develop the ability to present pharmaceutical chemistry research by means of an oral presentation, a scientific poster or a written report.
PSO-3. Students will be able to use and apply professional softwareôs relevant to chemistry.
PSO-4. Students will be able to demonstrate knowledge to develop Pharmaceutically important molecules, new drug delivery systems etc.

PSO-5. Students will demonstrate an ability to analyze and interpret data of analytical experiments in production, quality control & assurance of pharmaceutical synthesis and formulation.
PSO-6. Students will be able to apply analytical tools for determination of organic molecules.
PSO-7. Students will be able to generate validation protocol for all pharmaceutical operations starting from drug research to development to formulation.
PSO-8. Learn Role of drugs to inhibit the particular enzymes and treatment of disease
PSO-9. Learn Mode of action of different drugs.

6. Course Structure

The course structure of the Masters in Pharmaceutical Chemistry programme shall be as under.

Course No.	Name of the Couse	Credit	Remark
	Semester I		
PHCHCC-101	Physical Chemistry	**04**	**Core Course**
PHCHCC-102	Organometallic & Nuclear Chemistry	**04**	**Core Course**
PHCHCC-103	Organic Chemistry	**04**	**Core Course**
PHCHCC-104A PHCHCC-104B	Inorganic Chemistry Practical Organic Chemistry Practical	**08**	**Core Course**
PHCHVC-101	Separation Techniques	**04**	Value Added (Credited)
	Semester Total	**24**	
	Semester II		
PHCHCC-201	Pharmacology and Drug Design	**04**	**Core Course**
PHCHCC-202	Pharmacognosy	**04**	**Core Course**
PHCHCC-203	Chemistry of Natural Products and Biomolecules	**04**	**Core Course**
PHCHCC-204	Project and Seminar Presentation	**04**	**Core Course**
PHCHCC-205A PHCHCC-205B	Inorganic Chemistry Practical Organic Chemistry Practical	**08**	**Core Course**
PHCHVNC-201	Science and Technology of Cosmetics	**00**	Value Added (Non Credited)
	Semester Total	**24**	
	Semester III		
PHCHCC-301	Project and Seminar	**04**	**Core Course/** MOOC
PHCHCC-302	Pharmaceutical Chemistry Practical	**04**	**Core Course**
PHCHEL-302	Spectroscopic Methods in Pharmaceutical Chemistry	**04**	**Elective Course**
PHCHEL-301A	Medicinal Chemistry-I	**04**	**Elective Course**
PHCHEL-301B	Medicinal Chemistry-II		
PHCHIN-301	Summer Training	**04**	Summer Training
PHCHIER-301	Concepts of Chemistry	**04**	Interdepartmental Course
	Semester Total	**24**	
	Semester IV		
PHCHCC-401	Advance Organic Chemistry Practical	**04**	**Core Course**
PHCHEL-401	Biochemistry and Bacteriology	**04**	**Elective Course**
PHCHEL-401A	Chemistry of Analgesics and Antipyretics	**04**	**Elective Course**
PHCHEL-401B	Bioethanol as Biofuel		
PHCHMT-401	Dissertation and Master Thesis	**08**	**Master Thesis**

Course No.	Name of the Couse	Credit	Remark
PHCHIRA-401	Analytical Chemistry	**04**	Intradepartmental Course
	Semester Total	**24**	
	GRAND TOTAL	**96**	

PHCH - Subject; PHCHCC - Core Course; PHCHVC – Value added (credited); PHCHVNC – Value added (non-credited); PHCHEL – Elective; PHCHIER – Interdepartmental course; PHCHIRA – Intradepartmental course

7. Course Outlines

PROGRAMME STRUCTURE

The Master of Science in Pharmaceutical Chemistry is a Two Year Full Time Course consisting of Four Semesters.
Semester I
Semester II
Semester III
Semester IV

Sem	Core Course			Elective Course			Open elective Course			Value Added		Total Credits
	No. of Papers	Credits (L+T/P	Total Credits	No. of Papers	Credits (L+T/P	Total Credits	No. of Papers	Credits (L+T/P	Total Credits	No. of Papers	Credits	
I	4	12+8	20	0	0+0	0	0	0+0	0	1	4	24
II	5	16+8	24	0	0+0	0	0	0+0	0	1	0	24
III	3	4+4+4	12	2	4+4	8	1	4+0	4	0	0	24
IV	2	4+8	12	3	4+4+4	12	0	0+0	0	0	0	24
Total Credits			68			20			4		4	96

UNIVERSITY OF LUCKNOW
MASTERS OF PHARMACEUTICAL CHEMISTRY PROGRAMME
REGULATION 2020

Semester-III

Paper Code	Title of the paper	Credits	Int. Ass.	Uni. Exam.	Marks
PHCHCC-301	Project and Seminar	4			
PHCHCC-302	Pharmaceutical Chemistry Practical	4			
PHCHEL-302	Spectroscopic Methods in Pharmaceutical Chemistry	4			
PHCHEL-301A or **PHCHEL-301B**	Medicinal Chemistry-I or Medicinal Chemistry-II	4			
PHCHIN-301	Summer Training	4			
PHCHIER-301	Concepts of Chemistry	4			
	Total	24			

PHCH - Subject; PHCHCC - Core Course; PHCHVC – Value added (credited); PHCHVNC – Value added (non-credited); PHCHEL – Elective; PHCHIER – Interdepartmental course; PHCHIRA – Intradepartmental course

M.Sc. Pharmaceutical Chemistry Semester III Syllabus
Core Course/MOOC
Paper Code PHCHCC-301: Project and Seminar

Credits 04

Course Objective:

To inculcate in students the art of public speaking, presentation and discussion of seminars.

Course Outcome:

CO-1. students should be able demonstrate ability to plan and strategize a scientific problem, and implement it within a reasonable time frame.

CO-2. It is expected that after completing this project dissertation, students will learn to work independently and how to keep accurate/readable record of assigned project.

CO-3. In addition, students will be able to know the library search and handle the data in a meaningful way.

CO-4. Also, students will be able to interpret the spectral data independently.

CO-5. Subsequently, the students should be able to critically examine research articles, and improve their scientific writing/communication skills and power point presentation.

For project work and seminar presentation, the area of the work would be to be decided by the advisor/mentor based on syllabus. On completion of the project work, students have to submit the work in the form of seminar followed by oral presentation in the presence of faculty members.

M.Sc. Pharmaceutical Chemistry Semester III Syllabus
Core Course
Paper Code PHCHCC-302: Pharmaceutical ChemistryPractical

Credits: 04

Course Objective:

This course has been drafted with an objective to introduce the learner to understand TLC technique, drug Analysis and isolation of various phytochemicals.

Course Outcome:

After the completion of the course the student will acquire the knowledge of:

CO-1. Understand Thin Layer Chromatographic technique for separation of crude plant extracts and their detection.
CO-2. The students will be well versed with Pharmacopoeia of India (I.P.) and British Pharmacopoeia.
CO-3. Analysis of many drugs.
CO-4. Isolation of various phytochemicals from their natural sources.

Extraction of Natural Products

1. Preparation of some specified crude plant extracts and qualitative analysis (chemical or TLC) of crude plant extracts/ products to detect the presence of phytochemicals- alkaloids, carbohydrates, glycosides, tannins, flavanols and saponins.
2. Analysis of drugs as per Pharmacopoeia of India (I.P.) and British Pharmacopoeia (B.P.),

Isolation of phytochemicals from their natural sources.

Caffeine from Tea
Piperine from black pepper
Cucumin from turmeric
Citric acid from lemon
Lycopene from tomato
ɑb-Carotene from carrot
Trimyristin from nutmeg
Eugenol from cloves

Recommended Books:

1. Sethi, Arun.,Systematic Lab Experiments in Organic Chemistry, New Age International Publisher.
2. Furniss, B.S.; Hannaford, A.J.; Smith, P.W.G.; Tatchell, A.R. Practical Organic Chemistry, 5th Ed., Pearson (2012).
3. Ahluwalia, V.K. & Aggarwal, R. Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis, University Press (2000).
4. Indian Pharmacopoeia (I.P.).
5. British Pharmacopoeia (B.P.).

M.Sc. Pharmaceutical Chemistry Semester III Syllabus
Elective Course
Paper Code PHCHEL-302: Spectroscopic Methods in Pharmaceutical Chemistry
Credits 4 **Hours 60**

Course Objective:

The aim of the course is to make students understand the general principles of various types spectroscopic methods. In addition to the above, it is also aimed at providing a better understanding of the structure of organic compounds using UV, IR, NMR and mass spectroscopic techniques.

Course Outcome:

CO-1. The chapter makes the student aware of various types of transitions and how they are affected by change of solvent polarity.
CO-2. Woodward Fieser and Fieser Kuhn rules for the calculation of ɔ max is also explained.
CO-3. The IR chapter takes into account various types of fundamental vibration, combination bands, overtones and Fermi resonance. The effect of ring size, hydrogen bonding, types of substituents on the position of fundamental vibration was also explained.
CO-4. The steps are taken to explain the position of fundamental vibration for each group and then students were made to solve different spectral problems of IR.

Unit I

Ultraviolet-Visible and Chirooptical Spectroscopy: Energy levels and selection rules, Woodward-Fieser and Fieser-Kuhn rules. Influence of substituent, ring size and strain on spectral characteristics. Solvent effect, Stereochemical effect, non-conjugated interactions. Chirooptical properties-ORD, CD, octant rule, axial haloketone rule, Cotton effect. Poblems based on the above topics.

Unit II

Infrared Spectroscopy: Fundamental vibrations, characteristic regions of the spectrum (fingerprint and functional group regions), influence of substituent, ring size, hydrogen bonding, vibrational coupling and field effect on frequency, determination of stereochemistry by IR technique. IR spectra of different groups. Problems on spectral interpretation with examples.

Unit III

Nuclear Magnetic Resonance Spectroscopy: Magnetic nuclei with special reference to 1H and13C nuclei. Chemical shift and shielding/deshielding, factors affecting chemical shift, relaxation processes, chemical and magnetic non-equivalence, local diamagnetic shielding and magnetic anisotropy. Proton and 13C NMR scales. Spin-spin splitting: AX, AX2, AX3, A2X3, AB, ABC, AMX type coupling, first order and non-first order spectra, Pascalôs triangle, coupling constant, mechanism of coupling, Karplus curve, quadrupole broadening and decoupling, diastereomeric protons, virtual coupling, long range coupling-epi, peri and bay effects.

Unit IV

NOE. NOE and cross polarization. Simplification non-first order spectra to first order spectra: shift reagents, spin decoupling and double resonance, off resonance decoupling. Chemical shifts and homonuclear/heteronuclear couplings. Basis of heteronuclear decoupling. 2D NMR and COSY, HOMOCOSY and HETEROCOSY Polarization transfer. Selective Population

Inversion. DEPT, INEPT and RINEPT. Sensitivity enhancement and spectral editing, MRI. Problems on spectral interpretation with examples.

Unit V

Mass Spectrometry

Molecular ion: ion production methods (EI). Soft ionization methods: SIMS, FAB, CA, MALDI, PD, Field Desorption Electrospray Ionization. Fragmentation patterns-nitrogen and ring rules. McLafferty rearrangement and its applications.HRMS, MS-MS, LC-MS, GC-MS. Problems on spectral interpretation with examples.

X-ray

Recommended Books:

1. Spectrometric Identification of Organic Compounds, Silversteine and Basser, Willey.
2. Organic Chemistry J. Clayden, N. Greeves, S. Warren and P. Wothers (Oxford Press.)
3. Organic Spectroscopy, P.S. Kalsi, New Age International (P) Limited.
4. Spectroscopy of Organic Compounds, Pavia, Mery Finch Publication.
5. Organic Spectroscopy, I Fleming, McGraw-Hill Inc., US.
6. Advanced Organic Chemistry: Structure & Mechanisms, Ashutosh Kar, Medtech.

M.Sc. Pharmaceutical Chemistry Semester III Syllabus
Elective Course
Paper Code PHCHEL-301A: Medicinal Chemistry-I

Credits 4 **Hours 60**

Course Objective:

The aim of this course is to make students to understand about the various classes of medicinal compounds, their uses.

Course Outcome:

After the completion of the course the student will acquire the knowledge of:

CO-1. Absorption, distribution, metabolism and excretion of drugs, clinical pharmaco-kinetics, therapeutic drugs monitoring.
CO-2. cholinergic agonists, anticholinesterase agents, organophosphorus poisoning and its treatment.
CO-3. adrenergic receptor blocking agents, Adrenergic neuron blocking drugs and ganglionic stimulants and blocking agents.
CO-4. digitalis glycoside and other drugs effective in cardiac failure and drugs affecting coagulation, bleeding and thrombosis.
CO-5. general consideration of chemotherapy, classifications, mode of actions, principles of selecting anti-infective agents.
CO-6. use of some drugs in emergency (Myocardial infarction, hypertensive emergency, acute cardiac failure, anaphylaxis, cardiovascular collapse, pulmonary embolism etc.)

Unit I

Drugs acting on ANS

Adrenergic stimulants: Phenyl ethanolamine derivatives:adrenaline, isoprenaline, salbutamol,ephedrine, and phenylephrine. Imidazole derivatives:naphazoline, xylometazoline and oxymetazoline.

Adrenergic blockers: Ŭand ɓ adrenoreceptor antagonists: phenoxybenzamine, phentolamine, tolazoline, DCI,
Cholinergic stimulants:nicotinic and muscarinic receptors, pilocarpine, bethanechol and carbachol.
Cholinergic blockers: tertiary and quaternary antimuscarinics,
antispasmodic drugs: dicyclomine, glycopyrrolate,
antiulcer drugs: pirenzepine, cycloplegic drugs-tropicamide, homatropine.

Unit II
Anticholinesterases:
Competitive inhibitors: physostigmine and neostigmine
Non competitive inhibitors: organophosphorus compounds, Nerve gases,
Cholinesterase regenerators:2 PAM.
Ganglion blocking agents: mecamylamine and trimethophan
Synthesis of the following drugs: salbutamol, naphazoline, tolazoline, propranolol, bretilium, carbachol, mecamylamine and gallamine.

Unit III
Drugs acting on CVS
Cardiotonic drugs: cardiac glycosides-their chemistry and stereochemistry, Digoxin and digitoxin.
Antiarrhythmic drugs: quinidine, disopyramide, phenytoin and procainamide
Calcium channel blockers: verapamil, Nifdipine and Neurone blockers-bretilium.
Antihypertensive Drugs: peripheral antiadrenergics-prazosin and terazosin. Centrally acting drugs-reserpine, clonidine and methyl dopa. ɓ-blockers propranolol, atenolol and labetalol.. ACE inhibitors-captopri. Angiotensin receptor blockers-losartan.
Antianginal drugs: vasodilators-nitrites and nitrates,
Anticoagulants: heparin, coumarin derivatives and indane dione derivatives.
Antilipidemic agents: Statins-lovastatin,simvastatin, fluvastatin, Fibrates-clofibrate.
Synthesis of the following drugs: procainamide, disopyramide, amlodipine,verapamil, captopril and fluvastatin.

Unit IV
Chemotherapy
Sulphonamides: sulphanilamide, N-substituted sulphanilamide derivatives, mechanism of action, sulphones-dapsone, dihydrofolate reductase inhibitorstrimethoprim and cotrimoxazole.
Antitubercular agents: first line drugs-isoniazid, rifampicin, pyrazinamide, ethambutol, and streptomycin. Second line drugs-ethionamide, paraaminosalicylic acid and fluoroquinolones.
Antifungal agents: Azole derivatives-ketoconozole,terconozole,fluconozole and clotrimazole. Pyrimidine derivatives- 5 Flucytosine.

Unit V
Antiviral drugs: amantidine, interferon and ribavirin. Anti HIV agents zidovudine, and abacavir. Anti herpes simplex agents-brivudine, vidarabin and acyclovir. Anti-influeza agents-oseltamivir(tamiflu).
Antiprotozoal agents: Amoebicides-metranidazole and tinidazole.
Anthelmintics piperazines and benzimidazoles. .
Synthesis of the following drugs: ampicillin, cephalexin, chloramphenicol, sulphamethoxazole, dapsone, trimethoprim, ethambutol, griseofulvin, clotrimazole, acyclovir, metranidazole, primaquine, mebendazole.

Recommended Books:

1. Medicinal Chemistry, D. Sriram, P. Yogeeswari, Pearson Education.
2. Medicinal Chemistry, Ashutosh Kar, New Age International (P) Limited.
3. An Introduction to Medicinal Chemistry, Graham L. Patrick, Oxford University Press.
4. Textbook of Medicinal Chemistry, V. Alagarsamy, Elsevier Health Sciences.
5. The Practice of Medicinal Chemistry, Camille G. Wermuth, Elsevier Health Sciences.
6. Drug-like Properties: Concepts, Structure Design and Methods: From ADME to Toxicity Optimization, Edward H Kerns, Li Di, Elsevier Health Sciences.

M.Sc. Pharmaceutical Chemistry Semester III Syllabus
Elective Course
Paper Code PHCHEL-301B: Medicinal Chemistry-II

Credits 04 **Hours 60**

Course Objective:

The aim of this course is to make students to understand about the various classes of medicinal compounds, their uses and the concepts of drug design, their receptor sites, receptor-ligand interactions.

Course Outcome:

After the completion of the course the student will acquire the knowledge of:

CO-1. understanding how antineoplastic drugs work and their therapeutic approaches.
CO-2. synthesis of some cancer treating drugs and the proprietary names, mechanisms of action, therapeutic indications, and side effects of a wide array of psychopharmacological agents.
CO-3. common Diuretics and their mechanism of action, synthesis of some sedative and hypnotic.
CO-4. histamine and its biological role, Anti-diabetic medication and local anesthesia and the properties of local anesthetic agents.
CO-5. medicines used to suppress or relieve coughing i.e. Antitussives and synthesis of some related drugs.

Unit I

Antineoplastic Drugs:Neoplasm-cause therapeutic approaches. Alkylating agents-nitrogen mustards,nitrosourea, aziridines and aryl sulphonates. Antimetabolites-folic acid.Antagonists-purine and pyrimidine antagonists. Antibiotics-anthracyclines,actinomycinD, bleomycin. Plant products-vinca alkaloids, taxol derivatives.
Hormones and their antagonists-tamoxifen.

Unit II

Synthesis of the following drugs: chlorambucil, carmustin, thiotepa, methotrexate, 5-fluoro uracil, procarbazine.
Psychopharmocological Agents
Antidepressants: MAO inhibitors-Isocarboxazide, tranylcypromine and phenelzine. Tricyclic compounds-imipramine, trimipramine, amitriptynine, doxepine, amoxapine
Antipsychotics: phenothiazine and thiothixene derivatives, butyrophenones: haloperidol, droperidon. Hallucinogens: triptaminederivatives-DMT, psilocybin, phenylalkylaminesmescaline, lysergic acid derivatives-LSD.

Unit III

Synthesis of the following drugs: chlordiazepoxide, imipramine, chlorpromazine, tranylcypromine and haloperidol.

Diuretics: common diuretics and their mechanism of action-mercurial and nonmercurial diuretics, carbonic anhydrase inhibitors- acetazolamide and methazolamide, thiazide derivatives-hydrochlorothiazide, Loop diureticsfurosemide and ethacrynic acid, potassium sparing diuretics-amiloride, spironolactone.

Unit IV

Antihistaminic drugs: histamine and its biological role, H1 antagonists: aminoalkyl ethers, diphenhydramine and doxylamine, ethylenediamine derivatives-pyrilamine, , piperazine derivatives-cyclizines, miscellaneous compounds-cetrizine and cyproheptadine.
Hypogycemic agents: type 1 and type 2 diabetes, insulin, suphonyl ureas tolbutamide, acetohexamide and glibenclamide, biguanides-metformin, thiazolidinediones-rosiglitazone.
Local anaesthetics: clinical application of local anaesthesia, coca and cocaine, hexylcaine, para aminobenzoic acid derivative-benzocaine, procaine, tetracaine,chloroprocaine, anilides, lidocaine, etiodacaine and prilocaine.

Unit V

Antitussives: centrally acting antitussives-opium alkaloids and synthetic substitutes-codaine, noscapine, pholcodine, ethylmorphine, dextromethorphan, Non narcotic antitussives-diphenhydramine, expectorants-terpin hydrate, guaicol and bromhexine.
Synthesis of the following drugs: acetazolamide, chlorthiazide furosemide, ethacrynic acid, amiloride, diphenhydramine, pyrilamine, promethazine, omeprazole, tolbutamide, phenformin, benzocaine, procaine lidocaine, dextromethorphan.

Recommended Books-

1. Medicinal Chemistry, D. Sriram, P. Yogeeswari, Pearson Education.
2. Medicinal Chemistry, Ashutosh Kar, New Age International (P) Limited.
3. An Introduction to Medicinal Chemistry, Graham L. Patrick, Oxford University Press.
4. Textbook of Medicinal Chemistry, V. Alagarsamy, Elsevier Health Sciences.
5. The Practice of Medicinal Chemistry, Camille G. Wermuth, Elsevier Health Sciences.
6. Drug-like Properties: Concepts, Structure Design and Methods: From ADME to Toxicity Optimization, Edward H Kerns, Li Di, Elsevier Health Sciences.
7. Ram V. J.; Sethi, A.; Nath, M.; Pratap, R.; (2019), The Chemistry of Heterocycles (Nomenclature and Chemistry of three to five membered Heterocycles), Elsevier publication.
8. Ram V. J.; Sethi, A.; Nath, M.; Pratap, R.; (2019), The Chemistry of Heterocycles (Chemistry of six to eight membered N, O, S, P and Se heterocycles), Elsevier publication.

M.Sc. Pharmaceutical Chemistry Semester III Syllabus
Summer Training
Paper Code PHCHIN-301: Summer Training

Credits 04

Course Objective:

To familiarize students with the procedure of applying for summer training. In the summer training, students are expected to learn about the R&D procedures, manufacturing techniques,preparation of final presentation and report upon completion of the same.

Course Outcome:

CO-1. To learn the procedure of identifying, approaching, applying and getting approval of internship from pharmaceutical companies.
CO-2. To witness the entire work area of the pharmaceuticals.
CO-3. To understand the nature of job.
CO-4. To identify the RD procedures and technical skills involved.
CO-5. To understand the complete mechanism of the reactions involved in the manufacturing areas at different sectors.
CO-6. To correlate the manufacturing procedures with simple laboratory synthesis.
CO-7. To learn the environment aspects, pollution, their control involved in the manufacturing unit.
CO-8. To prepare a final evaluation report and presentation for the internship carried out for 90 to 100 days.

3-4 Months training in any Pharmaceutical or Scientific laboratory. After the completion of training project report will be submitted, followed by its evaluation by presentation & viva-voce examination.

M.Sc. Pharmaceutical Chemistry Semester III Syllabus
Interdepartmental Course
Paper Code PHCHIER-301: Concepts of Chemistry

Credits 4 **Hours 60**

Course Objective:

After successful completion of the first year of Masters, students from other faculties coming in third semester will be provided understanding into the fundamental of chemistry.

Course Outcome:

After the completion of the course the students will acquire the knowledge of:

CO-1: Use of arrow notations in Organic reactions mechanism, different kinds of polymer and their importance, different techniques of polymerization, each quantum number represents and how to obtain quantum numbers for any electron in an atom and determine the number of protons, neutrons, electrons and nuclei in elements and compounds.
CO-2: Periodic properties of all the elements, electronegativity and whether a bond is metallic, ionic, covalent or polar covalent.
CO-3: Predict atomic structure, chemical bonding or molecular geometry based on accepted models
CO-4: Electronic effects operates in covalent bonds, Types of Reactions and different types of Intermediates formed during the reactions

CO-5: Appropriate method of solution for a variety of Mathematic problems, basic physical quantities and various gas Laws for observation of behaviour of gas and Kinetic molecular model.

Unit I

Types of arrows used in Organic Reaction Mechanism ï Curved arrow, half- headed and double headed arrows

Introduction of Polymers, natural and synthetic polymers, properties of polymers, Biomedical polymers and their importance

Quantum numbers. Zeeman effect. Pauliôs exclusion principle. Aufbau principle. Effective nuclear charge, screening effect, Slaterôs rule- applications and limitations

Unit II

Classification of Elements and Periodicity of Properties, noble gases and s, p, d and f- block elements. Modern periodic teble. Position of hydrogen in the periodic table. Horizontal, vertical and diagonal relationships in the periodic table. Scales of electronegativity- Pauling, Mulliken and Allred Rochow scale.

Ionic bond ï factors influencing the formation of ionic compounds ï ionization energy, electron affinity and lattice energy; inert pair effect, Fajanôs rules. Covalent bond ï polarity of covalent bond.

Unit III

Valence bond theory (VBT) ï sigma and pi bonds, hybridization, valence shell electron pair repulsion (VSEPR) theory and geometries of molecules ï $BeCl_2$, H_2O, BF_3, NH_3, XeF_4, BrF_3, PCl_5, SF_6 and IF_7.

Molecularorbital theory (MOT) ï bonding and antibonding orbitals, bond order, applications of MOT to H_2, He_2, N_2, O_2, O_2^+, O_2^-, HF and CO. Comparison between VBT and MOT.

Unit IV

Resonance and Inductive effect

Reaction Intermediates ï Homolytic and Heterolytic bond breaking (carbonium ion, carbanion and free radical)

Types of Reactions ï Addition, Elimination, Substitution and Rearrangement Reactions.

Unit V

Mathematical concepts:

Logarithm, anti-logarithm, functions, integrations and differentiation, partial differentiation, trigonometric functions, exponential functions, binary and decimal numbers.

Basics of physical chemistry:

Physical quantities- moles, mole fraction, normality, molality, molarity, formality, equivalent weight, molecular weight and their determination, SI units and derived units.

Kinetic molecular theory:

Ideal and non- ideal gases, laws of gases, the kinetic molecular model, expressions for the pressure of gas, molecular velocities and their relations, mean free path, collision diameter, collision number.

Recommended Books:

1. Inorganic Chemistry, Puri, Sharma, Kalia and Kaushal.
2. Pradeep's Inorganic Chemistry, K. K. Bhasin, Pradeep Publication.
3. Chemistry for Degree Students, R. L. Madan, S. Chand Publishing.
4. Organic Chemistry, M. K. Jain, Shoban Lal & Co.
5. Pradeep's Organic Chemistry, S. N. Dhawan, Pradeep Publication.
6. Physical Chemistry, Puri Sharma & Pathania.
7. Pradeep Physical Chemistry, Khetrapal, Pradeep Publication.