

COURSE HANDOUT
PHARMACEUTICAL ORGANIC CHEMISTRY –I (THEORY)
COURSE CODE: BP202T

VISION

Train the minds to think logically and become a success

MISSION

To Develop inventive, pioneering research & high-quality technical education

PROGRAMME EDUCATIONAL OBJECTIVES

- PEO 1:** To produce graduates with sound theoretical knowledge and technical skills required for career opportunities in various domains.
- PEO 2:** To incite the students towards research and to address the challenges with their innovative Contributions for the benefit of mankind.
- PEO 3:** To bring forth a quality professional equipped with technological advances to adapt easily to changes in the ever-evolving pharma and allied industry, hospital and clinical pharmacy setup, pharma retailing and distribution, and governmental and health agencies.
- PEO 4:** To engage graduates in professional ethical practices in a multidisciplinary environment, while contributing to organization through leadership and building team spirit.
- PEO 5:** Pharmacists can become lifelong learners, absorb new technologies, and then offer leadership roles in society.

Programme Name	Bachelor of Pharmacy (B. Pharmacy)
Course Name	Pharmaceutical Organic Chemistry –I (Theory)
Course Code	BP202T
Session	
Semester	II
Lecture/Tutorial (Per Week)	3 (3-1-0)
Course Credit	4
Course Coordinator Name	

1. Scope of the Course:

This course involves the categorization and naming of basic organic compounds, the concept of structural isomerism, the identification of intermediate compounds formed during reactions, significant physical characteristics, chemical reactions, and techniques for producing these compounds.

Course Outcomes (COs):

- 202.1. Account for classification, nomenclature and isomerism of organic compounds
- 202.2. Understand the method of preparations, chemical reactions, hybridization, reactivity and reaction orientation of alkanes, alkenes, and conjugated dienes.
- 202.3. State the nomenclature, method of preparations, and chemical properties of alkyl halides. Assimilate the qualitative tests and uses of alcohol.
- 202.4. Demonstrate the naming reactions, uses, structures and qualitative tests of carbonyl compounds.
- 202.5. Explicate the acidity/basicity, effect of substituents, structures, qualitative tests and uses of carboxylic acids and aliphatic amines

2. Text Books:

- TB.1 Morrison R, Boyd R. Organic Chemistry. Calouste Gulbenkian Foundation, Lisbon.
TB.2 Finar IL. Organic Chemistry. Orient Longamann Ltd, Australia.
TB.3 Bahl BS, Bahl Arun. A Textbook of Organic Chemistry. S Chand & Co Ltd, New Delhi
TB.4 Mukhrji SM. Textbook of Organic Chemistry. New Age International, United Kingdom.

3. Reference Books:

- RB.1 Smith MB, March J. March's Advanced Organic Chemistry. John Wiley & Sons, New Jersey.
RB.2 Laue T, Plagens A. Named Organic Reactions. John Wiley & Sons Ltd, Chichester.

4. Other Readings & Relevant Websites:

Sr. No.	Link of Journals, Magazines, Websites and Research Papers
1	https://www.slideshare.net/
2	https://www.pharmatutor.org/

5. Course Plan:

Subject: Pharmaceutical Organic Chemistry –I		Subject Code: BP202T	
Sr. No.	Topics	No. of Lectures	
1	Classification, nomenclature and isomerism: Classification of Organic Compounds Common and IUPAC systems of nomenclature of organic compounds (Up to 10 Carbons open chain and carbocyclic compounds). Structural isomerism's in organic compounds	07	
2	Alkanes*, Alkenes* and Conjugated dienes: SP ³ hybridization in alkanes, Halogenation of alkanes, uses of paraffins. Stabilities of alkenes, SP ² hybridization in alkenes. E ₁ and E ₂ reactions – kinetics, order of reactivity of alkyl halides, rearrangement of carbocations, Saytzeffs orientation and evidences. E ₁ versus E ₂ reactions, Factors affecting E ₁ and E ₂ reactions. Ozonolysis, electrophilic addition reactions of alkenes, Markownikoff's orientation, free radical addition reactions of alkenes, Anti Markownikoff's orientation. Stability of conjugated dienes, Diel-Alder, electrophilic addition, free radical addition reactions of conjugated dienes, allylic rearrangement	10	
3	Alkyl halides - SN ₁ and SN ₂ reactions - kinetics, order of reactivity of alkyl halides, stereochemistry and rearrangement of carbocations. SN ₁ versus SN ₂ reactions, Factors affecting SN ₁ and SN ₂ reactions, Structure and uses of ethyl chloride, Chloroform, trichloroethylene, tetrachloroethylene.	05	
ST-I (Syllabus Covered from Lecture 01 to 22)			
1	Structure and uses of dichloromethane, tetrachloromethane and iodoform. Alcohols - Qualitative tests, Structure and uses of Ethyl alcohol, Methyl alcohol, chlorobutanol, Cetosteryl alcohol, Benzyl alcohol, Glycerol, Propylene	05	
2	Carbonyl compounds* (Aldehydes and ketones): Nucleophilic addition, Electromeric effect, aldol condensation, Crossed Aldol condensation, Cannizzaro reaction, Crossed Cannizzaro reaction, Benzoin condensation, Perkin condensation, qualitative tests, Structure and uses of Formaldehyde, Paraldehyde, Acetone, Chloral hydrate, Hexamine, Benzaldehyde, Vanilin, Cinnamaldehyde.	10	
3	Carboxylic acids*: Acidity of carboxylic acids, effect of substituents on acidity, inductive effect and qualitative tests for carboxylic acids, amide and ester. Structure and Uses of Acetic acid, Lactic acid, Tartaric acid, Citric acid, Succinic acid. Oxalic acid, Salicylic acid, Benzoic acid, Benzyl benzoate, Dimethyl phthalate, Methyl salicylate and Acetyl salicylic acid Aliphatic amines*: Basicity, effect of substituent on Basicity. Qualitative test, Structure and uses of Ethanolamine, Ethylenediamine, Amphetamine	08	
ST- II (Syllabus Covered from Lecture 23 to 45)			

6. Lecture Plan:

Sr. No.	Topics	Date (Tentative)		CO
		Section A	Section B	
01	Classification, and nomenclature	22.07.24	23.07.24	202.1

02	Isomerism	23.07.24	25.07.24	202.1
03	Classification of Organic Compounds	26.07.24	26.07.24	202.1
04	Common name of Organic compounds	29.07.24	30.07.24	202.1
05	IUPAC nomenclature of Organic compounds	30.07.24	01.08.24	202.1
06	Open chain and carbocyclic compounds)	02.08.24	02.08.24	202.1
07	Structural isomerism's in organic compounds	05.08.24	06.08.24	202.1
08	Alkanes, Alkenes and Conjugated dienes	06.08.24	08.08.24	202.2
09	SP ³ hybridization in alkanes, Halogenation of alkanes, uses of paraffins	09.08.24	09.08.24	202.2
10	Stabilities of alkenes, SP ² hybridization in alkenes	12.08.24	13.08.24	202.2
11	E1 and E2 reactions – kinetics, order of reactivity of alkyl halides, rearrangement of carbocations, Saytzeffs orientation and evidences	13.08.24	16.08.24	202.2
12	E1 versus E2 reactions, Factors affecting E1 and E2 reactions and Ozonolysis	16.08.24	20.08.24	202.2
13	Electrophilic addition reactions of alkenes, Markownikoff's orientation,	19.08.24	22.08.24	202.2
14	Free radical addition reactions of alkenes, Anti Markownikoff's orientation.	20.08.24	23.08.24	202.2
15	Stability of conjugated dienes, Diel-Alder	23.08.24	27.08.24	202.2
16	Electrophilic addition, free radical addition reactions of conjugated dienes	02.09.24	29.08.24	202.2
17	Allylic rearrangement	03.09.24	03.09.24	202.2
18	Alkyl halides SN ₁ and SN ₂ reactions - kinetics, order of reactivity of alkyl halides	06.09.24	05.09.24	202.3
19	Stereochemistry and rearrangement of carbocations	26.09.24	06.09.24	202.3
20	SN ₁ versus SN ₂ reactions, Factors affecting SN ₁ and SN ₂	27.09.24	27.09.24	202.3
21	Structure and uses of ethylchloride, Chloroform, trichloro-ethylene	30.09.24	29.09.24	202.3
22	Structure and uses of tetrachloroethylene, dichloro methane,	01.10.24	30.09.24	202.3
23	Structure and uses of tetrachloromethane and iodoform	04.10.24	01.10.24	202.3
24	Alcohols- Qualitative test	07.10.24	03.10.24	202.3
25	Structure and uses of Ethyl alcohol, Methyl alcohol	08.10.24	08.10.24	202.3
26	Structure and uses of chlorobutanol, Cetosteryl alcohol	14.10.24	10.10.24	202.3
27	Structure and uses of Benzyl alcohol, Glycerol, Propylene glycol	15.10.24	11.10.24	202.3
28	Carbonyl compounds (Aldehydes and ketones)	18.10.24	15.10.24	202.4
29	Nucleophilic addition, Electromeric effect	21.10.24	17.10.24	202.4
30	Cannizzaro reaction, Crossed Cannizzaro reaction	22.10.24	18.10.24	202.4
31	Benzoin condensation, Perkin condensation	25.10.24	22.10.24	202.4
32	Qualitative tests for Aldehydes and Ketones	20.10.24	24.10.24	202.4
33	Structure and uses of Formaldehyde, Paraldehyde	23.10.24	25.10.24	202.4
34	Structure and uses of Acetone, Chloral hydrate,	24.10.24	26.10.24	202.4
35	Structure and uses of Hexamine, Benzaldehyde	28.10.24	29.10.24	202.4
36	Structure and uses of Vanilin, Cinnamaldehyde	29.10.24	01.11.24	202.4
37	Aldol condensation, Crossed Aldol condensation	04.11.24	05.11.24	202.4
38	Carboxylic acids- Acidity of carboxylic acids, effect of substituents on acidity, inductive effect	05.11.24	07.11.24	202.5
39	Qualitative tests for carboxylic acids, amide and ester	08.11.24	08.11.24	202.5
40	Structure and Uses of Acetic acid, Lactic acid, Tartaric acid	11.11.24	12.11.24	202.5
41	Structure and Uses of Citric acid, Succinic acid. Oxalic acid, Salicylic acid	12.11.24	14.11.24	202.5
42	Structure and Uses of Benzoic acid, Benzyl benzoate	18.11.24	19.11.24	202.5
43	Structure and Uses of Dimethyl phthalate, Methyl salicylate and Acetyl salicylic acid	19.11.24	21.11.24	202.5
44	Aliphatic amines- Basicity, effect of substituent on Basicity	22.11.24	22.12.24	202.5
45	Qualitative test, Structure and uses of Ethanolamine, Ethylenediamine, Amphetamine	25.11.24	26.11.24	202.5

7. Tutorial Plan

Tutorial No.	Topic	Tentative date
1	IUPAC nomenclature of Organic compounds	27.07.24
2	Huckel's rule	03.08.24
3	Nomenclature of organic chemistry	10.08.24
4	E1 and E2 reactions and factor affecting them.	17.08.24
5	Electrophilic addition reactions of alkenes	24.08.24
6	Markownikoff's rule	31.08.24
7	SN1 versus SN2 reactions, Factors affecting SN1 and SN2 reactions	07.09.24
8	Factors affecting SN1 and SN2 reactions	28.09.24
9	Qualitative test of phenols	05.10.24
10	Benzoin condensation	12.10.24
11	Crossed Aldol condensation	19.10.24
12	Aldol condensation	26.10.24
13	Basicity of aliphatic amines	02.11.24
14	Acidity of carboxylic acid	09.11.24
15	Basicity of Aliphatic amines	30.11.24

8. Assignments Plan:

Sr. No.	Type of Assignment	Assignment	Marks	CO	PO	Tentative Date
1	Problem-solving	Common and IUPAC name of organic with their limitations	10	202.1	PO1, PO2, PO3, PO4, PO8, PO11	09.08.24
2	Multiple choice questions	MCQ's on alkanes, alkenes and conjugated dienes with their utilization in pharmacy	10	202.2	PO1, PO2, PO3, PO5, PO6, PO9, PO11	02.09.24
3	Reasoning	Order of reactivity of alkyl halides	10	202.3	PO1, PO2, PO3, PO4, PO5, PO11	15.10.24
4	Open book assignment	Structure, uses and reactions of various organic compounds	10	202.4	PO1, PO2, PO3, PO5, PO6, PO9, PO11	25.11.24
5	Problem solving	Acidity and Basicity of Carboxylic acids and aliphatic amines	10	202.5	PO1, PO2, PO3, PO4, PO5, PO6, PO9, PO11	30.11.24

9. Class Tests Plan:

Sr. No.	Test of Type	Topics	Marks	CO	PO (Annexure I)	Tentative Date
1	Quiz	Quiz on Classification, nomenclature and isomerism	10	202.1	PO1, PO2, PO3, PO11	09.08.24
2	Quiz	Quiz on Alkanes, Alkenes and Conjugated dienes along with their uses in pharmacy	10	202.2	PO1, PO2, PO3, PO5, PO8, PO11	20.08.24
3	Subjective	Reactions of alkyl halides and alcohols	10	202.3	PO1, PO2, PO3, PO11	27.09.24
4	Subjective	Reactions of Carbonyl compounds (Aldehydes and ketones)	10	202.4	PO1, PO2, PO3, PO11	21.10.24
5	Report	Acidity, basicity and effect of substituent on Carboxylic acid, Aliphatic amines	10	202..5	PO1, PO2, PO3 PO8, PO11,	26.11.24

10. Content Beyond Syllabus (CBS):

Sr. No.	Topics	PO to be Achieved
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1	Molecular structure model of various organic compounds	PO1, PO2, PO4, PO8, PO11
2	Predicting Trends in Acidity, Basicity, Boiling Points and Water Solubilities of Organic Compounds	PO1, PO2, PO3, PO4, PO6, PO8, PO11

11. Proposed Activity:

Sr. No.	Type of Activity	Topics	Tentative Date
1.	Guest Lecture	General guidelines for safe handling of chemicals in laboratory	27.09.24

12. Evaluation Scheme:

The marks allocated for continuous mode of internal assessment shall be awarded for attendance, academic activities and student-teacher interaction. Two sessional exams shall be conducted during mid of the semester. The average marks of two sessional exams shall be computed for internal assessment. Sessional exam shall be conducted for 30 marks and shall be computed for 15 marks. Weightage for various evaluation components is as below:

Sr. No.	Evaluation Component	Weightage
1	Internal Assessment	
	1. Continuous Mode	10
	2. Sessional Exams	15
2	End Semester Exam	75
	Total	100

As per PCI and University guidelines minimum 75% attendance is required to become eligible for appearing in the End Semester Examination.

This document is approved by:

Designation	Name	Signature
Course Coordinator		
HOD		
Principal		

ANNEXURE I: PROGRAM OUTCOMES

1. **Pharmacy knowledge:** Possess knowledge and comprehension of the core and basic knowledge associated with the profession of pharmacy, including biomedical sciences; pharmaceutical sciences; behavioural, social, and administrative pharmacy sciences; and manufacturing practices.
2. **Planning abilities:** Demonstrate effective planning abilities including time management, resource management, delegation skills, and organizational skills. Develop and implement plans and organize work to meet deadlines.
3. **Problem analysis:** Utilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions during daily practice. Find, analyze, evaluate and apply information systematically and shall make defensible decisions.
4. **Modern tool usage:** Learn, select, and apply appropriate methods and procedures, resources, and modern pharmacy-related computing tools with an understanding of the limitations.
5. **Leadership skills:** Understand and consider the human reaction to change, motivation issues, leadership and team-building when planning changes required for fulfillment of practice, professional and societal responsibilities. Assume participatory roles as responsible citizens or leadership roles when appropriate to facilitate improvement in health and wellbeing.
6. **Professional identity:** Understand, analyze, and communicate the value of their professional roles in society (e.g., health care professionals, promoters of health, educators, managers, employers, employees).
7. **Pharmaceutical ethics:** Honour personal values and apply ethical principles in professional and social contexts. Demonstrate behaviour that recognizes cultural and personal variability in values, communication, and lifestyles. Use ethical frameworks; apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions.
8. **Communication:** Communicate effectively with the pharmacy community and with society at large, such as being able to comprehend and write effective reports, make effective presentations and documentation, and give and receive clear instructions.
9. **The pharmacist and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, and legal issues and the consequent responsibilities relevant to the professional pharmacy practice.
10. **Environment and sustainability:** Understand the impact of professional pharmacy solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
11. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self-assess and use feedback effectively from others to identify learning needs and to satisfy these needs on an ongoing basis.