



**Raffles University, Neemrana,
Alwar, Rajasthan- 301705**

Course: Pharmaceutical Organic Chemistry-III (BP301T)

Number of Prescribed Hours: 60

Academic Year: 2023-24

Programme: B. Pharmacy

Name of Faculty: Dr. Chennu MM Prasada Rao

Year/Semester: II Year II Sem

TEACHING PLAN: Pharmaceutical Organic Chemistry-III

SCHOOL: (SOP) School Of Pharmacy		ACADEMIC SESSION: 2023-24	FOR STUDENTS' BATCH:	2022- 26
1	Course No.	BP401T		
2	Course Name	Pharmaceutical Organic Chemistry-III		
3	Credits	4 (3 Lectures+1Tutorial)		
4	Learning Hours	Theory hours	45	
		Tutorial	8	
		Preparation and Exam	4	
		Flipped	4	
		SL/AI	4	
		Total hours	65	
5	Course Objective	1. understand the methods of preparation and properties of organic compounds and heterocyclic compounds 2. explain the stereo chemical aspects of organic compounds and stereo chemical Reactions 3. know the medicinal uses and other applications of organic compounds		1.
6	Course Outcomes	1. Understand the Stereo-chemical features including optical isomerism and stereo electronic effects. 2. Understand the Geometrical isomers and biphenyl compounds and reactions. 3. To acquire the knowledge and understanding of the basic experimental principles of heterocyclic chemistry.		



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		<p>4. To draw the structures and synthesize simple pharmaceutically active organic compounds having five and six membered heterocyclic compounds.</p> <p>5. To describe detailed mechanisms for common naming reactions.</p>	
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7. Outline of the Syllabus

7.0 1	Paper Code	Unit	Introduction	Lectur es hours	Book tile	Page No
7.0 2	BP401T	Unit I Stereo isomerism	Unit-1: Optical isomerism – Optical activity, enantiomerism, diastereoisomerism, meso compounds Elements of symmetry, chiral and achiral molecules DL system of nomenclature of optical isomers, sequence rules, RS system of nomenclature of optical isomers Reactions of chiral molecules Racemic modification and resolution of racemic mixture. Asymmetric synthesis: partial and absolute	13	Text book of organic chemist ry by Bhal and Arun bhal	150- 179
		Unit II Geometrical isomerism, biphenyl compounds	Geometrical isomerism Nomenclature of geometrical isomers (Cis Trans, EZ, Syn Anti systems) Methods of determination of configuration of geometrical isomers.	12	Text book of organic chemist ry by	199- 233



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		Conformational isomerism in Ethane, n-Butane and Cyclohexane. Stereo isomerism in biphenyl compounds (Atropisomerism) and conditions for optical activity. Stereospecific and stereoselective reactions		Bhal and Arun bhal	
	Unit III Heterocyclic compounds	Nomenclature and classification Synthesis, reactions and medicinal uses of following compounds/derivatives Pyrrole, Furan, and Thiophene Relative aromaticity and reactivity of Pyrrole, Furan and Thiophene	12	Text book of organic chemistry by Bhal and Arun bhal	293-318
7.03	Unit IV Five and six membered heterocyclic compounds	Synthesis, reactions and medicinal uses of following compounds/derivatives Pyrazole, Imidazole, Oxazole and Thiazole. Pyridine, Quinoline, Isoquinoline, Acridine and Indole. Basicity of pyridine Synthesis and medicinal uses of Pyrimidine, Purine, azepines and their derivatives	13	Text book of organic chemistry by Bhal and Arun bhal	410-447



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		Unit V Reactions of synthetic importance	Metal hydride reduction (NaBH ₄ and LiAlH ₄), Clemmensen reduction, Birch reduction, Wolff Kishner reduction. Oppenauer-oxidation and Dakin reaction. Beckmanns rearrangement and Schmidt rearrangement. Claisen-Schmidt condensation	10	Text book of organic chemist ry by Bhal and Arun bhal	448- 473 & 575- 597
8	Course Evaluation					
8.1	Continuous Mode 10M (25%)					
8.1	Attendan 1 ce	4M (10%)				
8.1	Quiz, assignmen t open book test, field work, group discussion and seminar	6 Assignments and 3M (7.5%)				
8.1	Student – Teacher interaction	3M (7.5%)				
8.3	End-term examination: 75%					
9	Text Books & References					
9.1	Text books	1.Organic Chemistry by Morrison and Boyd 2. Organic Chemistry by I.L. Finar , Volume-I				



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		<p>3. Textbook of Organic Chemistry by B.S. Bahl & Arun Bahl.</p> <p>4. Stereochemistry by Kale</p>
9.2	Reference s	<p>4. Organic Chemistry by P.L.Soni</p> <p>5. Practical Organic Chemistry by Mann and Saunders.</p> <p>6. Vogel's text book of Practical Organic Chemistry</p> <p>7. Advanced Practical organic chemistry by N.K.Vishnoi.</p> <p>8. Introduction to Organic Laboratory techniques by Pavia, Lampman and Kriz.</p> <p>9. Reaction and reaction mechanism by Ahluwalia/Chatwal.</p>
9.3	Video Reference s	<p>https://www.youtube.com/watch?v=BRCc8BrUMwI</p> <p>https://nptel.ac.in/courses/104/103/104103071/</p> <p>http://www.freebookcentre.net/chemistry-books-download/Basics-of-Organic-Chemistry-and-Mechanism.html</p> <p>https://organicchemistrydata.org/links/</p> <p>https://www.organic-chemistry.org/</p> <p>https://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/intro1.htm</p>

Course Outcome Mapping with Programme Outcomes

CO's/PO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	M	M	S		L	M	M	L		M	S
CO2	M	M	S	S	L	M	M	L		M	S
CO3	M	M	S	S	L	M	M	L		M	S
CO4	M	M	S	S	L	M	M	L		M	S
CO5	M	M	S	S	L	M	M	L		M	S



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Teaching Plan Session Wise

S.No	Unit No	Session NO	Session Topic	Topic Content	Lecture No	Mode of Teaching
1	1	S1	Stereochemistry	Definition of isomerism, Classification with suitable examples	L1	BB, Ppt, Videos
2		S2	Optical isomerism	Definition and Polarimetry, Measurement of optical activity	L2	BB, Ppt, Videos
3		S3	enantiomers, diastereoisomerism, meso compounds	enantiomers, diastereoisomerism, meso compounds with suitable examples	L3	BB, Ppt, Videos
4			Tutorial-01	Tutorial-01	L4	BB, Ppt, Videos
5		S4	Elements of symmetry	Elements of symmetry chiral and achiral molecules with suitable examples	L5	BB, Ppt, Videos
6		S5	Configurational isomerism	Classification of Configurational Isomerism, Relative configuration with suitable examples	L6	BB, Ppt, Videos
7		S6	Configurational isomerism	Relative configuration with suitable examples and Determination of	L7	BB, Ppt, Videos



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			Configuration using RS Configuration		
8		Tutorial-02		L8	BB, Ppt, Videos
9	S7	Racemic modification and resolution of racemic mixture	Racemic modification and resolution of racemic mixture	L9	BB, Ppt, Videos
10	S8	resolution of racemic mixture	resolution of racemic mixture	L10	BB, Ppt, Videos
11	S9	Asymmetric synthesis: partial and absolute, Geometrical Isomerism	Asymmetric synthesis: partial and absolute, Geometrical isomerism Definition and Classification with examples	L11	BB, Ppt, Videos
12		Tutorial-03		L12	BB, Ppt, Videos
13	S10	Nomenclature of geometrical isomers	Nomenclature of geometrical isomers	L13	BB, Ppt, Videos
14	S11	Methods of determination of configuration of geometrical isomers.	Methods of determination of configuration of geometrical isomers.	L14	BB, Ppt, Videos
15	2	S12	Conformational isomerism	L15	BB, Ppt, Videos
16		Tutorial-04		L16	BB, Ppt, Videos
17	S13	Conformational isomerism in Ethane,	Conformational isomerism in Ethane,	L17	BB, Ppt, Videos



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		Propane, n-Butane, Cyclohexane	Propane. Conformational isomerism in n-Butane, Cyclohexane.		
18	S14	Stereo isomerism in biphenyl compounds	Stereo isomerism in biphenyl compounds, conditions for optical activity in biphenyl compounds	L18	BB, Ppt, Videos
19	S15	Stereospecific and stereoselective reactions	Stereospecific and stereoselective reactions	L19	BB, Ppt, Videos
20	S16	Heterocyclic compounds: Definition and nomenclature	Heterocyclic compounds: Definition and nomenclature	L20	BB, Ppt, Videos
21		Tutorial-05		L21	BB, Ppt, Videos
22	S17	Classification of heterocyclic compounds	Classification of heterocyclic compounds	L22	BB, Ppt, Videos
23	S18	Synthesis, structure and aromaticity of pyrrole	Synthesis, structure and aromaticity of pyrrole	L23	BB, Ppt, Videos
24	S19	Chemical reactions and uses of pyrrole	Chemical reactions and uses of pyrrole	L24	BB, Ppt, Videos
25		Tutorial-06		L25	BB, Ppt, Videos
26	S20	Synthesis, structure and aromaticity of Furan	Synthesis, structure and aromaticity of Furan	L26	BB, Ppt, Videos



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27	S21	Chemical reactions and uses of Furan	Chemical reactions and uses of Furan	L27	BB, PPT, Videos
28	S22	Synthesis, structure and aromaticity of Thiophene	Synthesis, structure and aromaticity of Thiophene	L28	BB, PPT, Videos
29		Tutorial-07		L29	BB, PPT, Videos
30	S23	Chemical reactions and uses of Thiophene	Chemical reactions and uses of Thiophene	L30	BB, PPT, Videos
31	S24	Reactivity of pyrrole, Furan, Thiophene	Reactivity of pyrrole, Furan, Thiophene	L31	BB, PPT, Videos
32	S25	Synthesis and rection and uses of pyrazole	Synthesis and rection and uses of pyrazole	L32	BB, PPT, Videos
33		Tutorial-08		L33	BB, PPT, Videos
34	S26	Synthesis and rection and uses of imidazole	Synthesis and rection and uses of imidazole	L34	BB, PPT, Videos
35	S27	Synthesis and rection and uses of oxazole	Synthesis and rection and uses of oxazole	L35	BB, PPT, Videos
36	S28	Synthesis and rection and uses of thiazole	Synthesis and rection and uses of thiazole	L36	BB, PPT, Videos
37		Tutorial-09		L37	BB, PPT, Videos
38	S29	Synthesis, structure and aromaticity of Pyridine	Synthesis, structure and aromaticity of Pyridine	L38	BB, PPT, Videos
39	S30	Chemical reactions and uses of Pyridine	Chemical reactions and uses of Pyridine	L39	BB, PPT, Videos
40	S31	Chemical reactions and uses of Pyridine	Chemical reactions and uses of Pyridine	L40	BB, PPT, Videos



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41		S32	Synthesis and rection and uses of Quinoline	Synthesis and rection and uses of Quinoline	L41	BB, Ppt, Videos
42			Tutorial-10		L42	BB, Ppt, Videos
43		S33	Synthesis and rection and uses of isoquinoline	Synthesis and rection and uses of isoquinoline	L43	BB, Ppt, Videos
44		S34	Synthesis and rection and uses of Acridine	Synthesis and rection and uses of Acridine, indole	L44	BB, Ppt, Videos
45		S35	Synthesis and rection and uses of Pyrimidine , purine	Synthesis and rection and uses of Pyrimidine , purine.	L45	BB, Ppt, Videos
46			Tutorial-11		L46	BB, Ppt, Videos
47		S36	Synthesis and rection and uses of Azepine, Acidine	Synthesis and rection and uses of Azepine, Acidine	L47	BB, Ppt, Videos
48	5	S37	Preparation, Mechanism, Applications of Lithium Aluminium Hydride	Preparation, Mechanism, Applications of Lithium Aluminium Hydride	L48	BB, Ppt, Videos
49		S38	Preparation, Mechanism, Applications of Lithium Aluminium Hydride	Preparation, Mechanism, Applications of sodium borohydride	L49	BB, Ppt, Videos
50			Tutorial-12		L50	BB, Ppt, Videos



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51	S39	Preparation, Mechanism, Applications of sodium borohydride	Preparation, Mechanism, Applications of sodium borohydride	L51	BB, Ppt, Videos
52	S40	Reaction, Mechanism, Applications of Wolff Kishner reduction.	Reaction, Mechanism, Applications of Wolff Kishner reduction.	L52	BB, Ppt, Videos
53	S41	Reaction, Mechanism, Applications of Oppenauer-oxidation	Reaction, Mechanism, Applications of Oppenauer-oxidation	L53	BB, Ppt, Videos
54		Tutorial-13		L54	BB, Ppt, Videos
55	S42	Reaction, Mechanism, Applications of Dakin reaction.	Reaction, Mechanism, Applications of Dakin reaction.	L55	BB, Ppt, Videos
56	S43	Reaction, Mechanism, Applications of Beckmann's rearrangement	Reaction, Mechanism, Applications of Beckmann's rearrangement	L56	BB, Ppt, Videos
57		Tutorial-14		L57	BB, Ppt, Videos
58	S44	Reaction, Mechanism, Applications of Schmidt rearrangement.	Reaction, Mechanism, Applications of Schmidt rearrangement.	L58	BB, Ppt, Videos
59	S45	Reaction, Mechanism, Applications of Claisen-Schmidt condensation	Reaction, Mechanism, Applications of Claisen- Schmidt condensation	L59	BB, Ppt, Videos
60		Tutorial-15		L60	



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QUESTION BANK

Unit-I

1. Define and classify stereoisomerism?
2. Write a note on optical isomerism and explain the optical rotation with neat labelled diagram?
3. Outline about the absolute and relative configuration with suitable examples?
4. Write a note on the sequence rules and its examples
5. Define the Asymmetric synthesis with examples
6. Elaborate the resolution and racemic modification of racemic mixture?
7. Write reactions of chiral molecules with suitable examples?

Unit-II

8. Write a note on geometrical isomerism and classify with suitable examples?
9. Explain EZ, Syn Anti systems with examples?
10. Determine the configuration of geometrical isomerism by different methods?
11. Explain the conformational isomerism in Ethane?
12. Explain the conformational isomerism in n-Butane?
13. Explain the conformational isomerism in Cyclohexane?
14. Explain Stereo isomerism in biphenyl compounds?
15. Explain Atropisomerism in biphenyl compounds? Write conditions for optical activity?
16. Write a note on Stereospecific suitable examples?
17. Write a note on stereoselective reactions with suitable examples?

Unit-III

18. Define and classify the Heterocyclic compounds with suitable examples?
 19. write Synthesis, reactions and medicinal uses of pyrrole?
 20. write Synthesis, reactions and medicinal uses of Furan?
 21. write Synthesis, reactions and medicinal uses of Thiophene?
 22. Write about reactivity of pyrrole and furan, thiophene?
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Unit-IV

23. Synthesis, reactions and medicinal uses of Pyrazole?
 24. Write a note on Synthesis, reactions and medicinal uses of Imidazole?
 25. Write a note on Synthesis, reactions and medicinal uses of oxazole?
 26. Write a note on Synthesis, reactions and medicinal uses of Thiazole?
 27. Write a note on Synthesis, reactions and medicinal uses of Pyridine
 28. Write a note on Synthesis, reactions and medicinal uses of quinoline?
 29. Write a note on Synthesis, reactions and medicinal uses of isoquinoline?
 30. Write a note on Synthesis, reactions and medicinal uses of Acridine?
 31. Write a note on Synthesis, reactions and medicinal uses of Indole?
 32. Write a note on Basicity of pyridine?
 33. Synthesis and medicinal uses of Pyrimidine, Purine, azepines and their derivatives
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UNIT-V

34. Write a note on Reactions of synthetic importance Metal hydride reduction?
 35. Write a note on Reactions of synthetic importance Clemmensen reduction?
 36. Write a note on Reactions of synthetic importance Birch Reduction?
 37. Write a note on Reactions of synthetic importance Wolff Kishner reduction?
 38. Write a note on Reactions of synthetic importance of Oppenauer-oxidation?
 39. Write a note on Reactions of synthetic importance of Dakin reaction?
 40. Write a note on Reactions of synthetic importance of Beckmanns rearrangement?
 41. Write a note on Reactions of synthetic importance of Schmidt rearrangement?
 42. Write a note on Reactions of synthetic importance of Claisen-Schmidt condensation?
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PROJECTS (To be given to group of students)

1. Practice on the Heterocyclic compounds?
2. Synthesis of some heterocyclic compounds?
3. Demonstration theoretical of Stereochemical reactions and stereo selective reactions?
4. Preparation of isomeric structures of organic compounds using models?
5. Preparation of the Metallic reagents and their uses?



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6. Complete a MOOC certification program on Organic synthesis in NPTEL, Coursera and UdeMy?