



# MAHATMA GANDHI COLLEGE

THIRUVANANTHAPURAM

POST GRADUATE DEPARTMENT OF CHEMISTRY & RESEARCH  
CENTER

## NOTICE

### ADD-ON COURSE –MOLECULAR SPECTROSCOPY

Department of chemistry is conducting an Add-On course titled "MOLECULAR SPECTROSCOPY" for the academic year 2018-2019. This course aims to provide students with an in-depth understanding of spectroscopic techniques and their practical applications.

Course Duration: 30 hour

**Last Date for Registration: 4/06/18**

For any queries or additional information, please contact the course coordinator, Head, Department of Chemistry.

Head, Department of Chemistry

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**Molecular spectroscopy**

**Unit I Introduction**

8h

General features of absorption - Beer-Lambert's law and its limitations, transmittance, Absorbance, and molar absorptivity. Single and double beam spectrophotometers. Electronic spectroscopy: Interaction of electromagnetic radiation with molecules and types of molecular spectra. Energy levels of molecular orbitals ( $\sigma$ ,  $\pi$ ,  $n$ ). Selection rules for electronic spectra. Types of electronic transitions in molecules effect of conjugation. Concept of chromophore and auxochrome.

**UNIT-II Infra red spectroscopy**

8h

Different Regions in Infrared radiations. Modes of vibrations in diatomic and polyatomic molecules. Characteristic absorption bands of various functional groups. Interpretation of spectra-Alkanes, Aromatic, Alcohols, carbonyls, and amines with one example to each.

**UNIT-III Proton magnetic resonance spectroscopy**

8h

Principles of nuclear magnetic resonance, equivalent and non-equivalent protons, position of signals. Chemical shift, NMR splitting of signals - spin-spin coupling, coupling constants. Applications of NMR with suitable examples - ethyl bromide, ethanol, acetaldehyde, 1,1,2-tribromo ethane, ethyl acetate, toluene and acetophenone.

**UNIT-IV**

6h

Instrument demonstration

UV-Visible spectroscopy, IR spectroscopy, Photoluminescence Spectrometer (PL)

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### Course Outcome

- Predict which organic compounds should exhibit visible color based upon extent of conjugation.
- Explain the origin of infrared absorptions in terms of vibrational modes of covalent bonds.
- Predict direction of chemical shifts caused by various structural shielding or deshielding effects.
- Explain the principle and instrumentation of electronic spectroscopy, Infrared spectroscopy, NMR spectroscopy and analyze the spectra of different species.

Academic Year 2018-2019		
Sl.No.	Name	Candidate Code
1	Abhirag G.R	235118506234
2	Amal Krishnan	235118524275
3	Amritha B.S	235118526686
4	Amritha M.B	235118520216
5	Anjana A.V	235118574223
6	Anjana M.G	235118516210
7	Aparna S	235118528245
8	Bharath S.Kumar	235118566031
9	Jithin Aji	235118525399
10	Kavya M Biju	235118564973
11	Keerthana R.S	235118510400
12	Maneesha M	235118523632
13	Midhun Raj I	235118537215
14	Neetha J.A	235118570529
15	Parvathy J	235118519510
16	Pradeep Sankar	235118500234
17	Sruthy M.R	235118550516
18	Surya S.S	235118578946
19	Yadukrishnan R.S	235118501126
20	Archa Santhosh	235118560338
21	Adithya A	235118536743
22	Akhil S	235118509782
23	Aneesh S.R	235118538714
24	Anoop M	235118591403
25	Arunima Chandra	235118511593
26	Athira Anil	235118520867
27	Badhush M.S	235118526247
28	Devika Venu J	235118548074
29	Govind G.S	235118551705
30	Greeshma G	235118508603
31	Jithin M.V	235118800292
32	Kallyani M	235118516388
33	Lekshmy A.K	235118575757
34	Lekshmy S.S	235118574076
35	Megha M Nair	235118572376
36	Neethu Lekshmy R.J	235118548320
37	Nikhil Rajendran	235118527693
38	Rajikrishna R.C	235118561819
39	Reshma S Nair	235118556305
40	Sreelekshmy R	235118507775
41	Sruthy S	235118524624
42	Sudheesh S	235118527714
43	Syama M.S	235118516577
44	Vrinda V.S	235118508098
45	Amritha R.V	235118538348
46	Anusha Raj	235118536117
47	Aravind M Raj	235118546153
48	Fathima S.N	235118535514

  
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49	Harikrishnan V	235118526060
50	Krishnanunni V.S	235118522296
51	Krishnapriya R	235118501405
52	J.D Haripriya	235118559736
53	Aiswarya Krishna	235118524092



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**Add on Course Examination**  
**Molecular Spectroscopy**  
**MCQ**  
**Answer all the questions**

**Marks: 10**

**Time: 15 minutes**

1. Absorption of radiation in the UV range attributable to  $n \rightarrow \pi^*$  electronic transitions is characteristic of which of the following types of compounds?

- a) Aromatic hydrocarbons.
- b) Unsaturated carbonyl compounds.
- c) Non-conjugated polyenes.
- d) Conjugated polyenes.

2. Which is the correct order of increasing wave number of the stretching vibrations of (1) C-H (alkane), (2) C-H (alkene), (3) C-H (alkyne), and (4) C-H (arene)?

- a)  $(1) < (2) \approx (3) < (4)$
- b)  $(4) < (3) \approx (2) < (1)$
- c)  $(3) < (4) \approx (2) < (1)$
- d)  $(1) < (4) \approx (2) < (3)$

3. Which of the following statements in the context of  $^1\text{H}$  NMR spectroscopy is true?

- a) Arene C-H chemical shift ( $\delta$ ) values are greater than simple alkenes C-H chemical shift values because of the aromatic ring current.
- b) Arene C-H chemical shift ( $\delta$ ) values are smaller than simple alkenes C-H chemical shift values because of the aromatic ring current.
- c) Arene C-H signals are always multiplets.
- d) Arene C-H signals are always singlets.

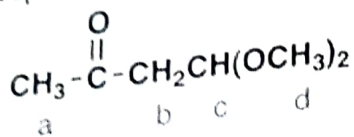
4. Which of the following statements is wrong?

- a) UV absorption is attributable to electronic transitions.
- b) UV spectra provide information about valence electrons.
- c) IR absorption is attributable to transitions between rotational energy levels of whole molecules.
- d) NMR spectrometers use radiofrequency electromagnetic radiation.

5. Which is the correct order of increasing wave number of the stretching vibrations of (1) C-H (alkane), (2) O-H (alcohol), (3) C=O (ketone), and (4) C $\equiv$ C (alkyne)?

- a)  $(4) < (3) < (2) < (1)$

- b) (3) < (4) < (2) < (1)  
 c) (3) < (4) < (1) < (2)  
 d) (4) < (3) < (1) < (2)
6. How many signals does the aldehyde  $(\text{CH}_3)_3\text{CCH}_2\text{CHO}$  have in  $^1\text{H}$  NMR spectra?
- a) five  $^1\text{H}$  signals and six  $^{13}\text{C}$  signals  
 b) three  $^1\text{H}$  signals and four  $^{13}\text{C}$  signals  
 c) five  $^1\text{H}$  signals and four  $^{13}\text{C}$  signals  
 d) three  $^1\text{H}$  signals and six  $^{13}\text{C}$  signals
7. Which of hydrogens a-d in the following molecule gives a triplet signal in a normal  $^1\text{H}$  NMR spectrum?



- a) hydrogen a  
 b) hydrogen b  
 c) hydrogen c  
 d) hydrogen d
8. Which hydrogen of 1-chloropent-2-ene shows the largest chemical (downfield) shift in its NMR spectrum?
- a) the H on C1  
 b) the H on either C2 or C3  
 c) the H on C4  
 d) the H on C5
9. Which carbon of (a)-(d) of hex-3-en-2-one shows the largest (most downfield) chemical shift in the NMR spectrum?
- a) C1  
 b) C2  
 c) C4  
 d) C6
10. Which of the following statements regarding IR spectroscopy is wrong?
- a) Infrared radiation is higher in energy than UV radiation.  
 b) Infrared spectra record the transmission of IR radiation.  
 c) Molecular vibrations are due to periodic motions of atoms in molecules, and include bond stretching, torsional changes, and bond angle changes.

d) Infrared spectra give information about bonding features and functional groups in molecules.



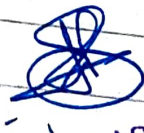
M.Sc. in Chemistry  
M.D. Dept. of Chemistry & Research Centre  
Manatma Gandhi College  
Chiruvannanapuram



2018 - 2019

Name	Candidate code	Marks (Out of 10)
1. Abhiraj G.R	235118506234	9
2. Anmol Krishnan	235118524275	10
3. Anshika B.S.	235118526686	9
4. Anshika M.B	235118520216	8
5. Anjana A.V.	235118574223	10
6. Anjana M.G.	235118516210	9
7. Aparana S	235118528245	8
8. Bharat S. kumar	235118566031	8
9. Jithin Aji	235118525399	10
10. Kavya M. Biju	235118564973	10
11. Keethana R.S.	235118510400	9
12. Maneesha M.	235118523632	9
13. Midhun Raj T.	235118537215	8
14. Neetha J.A.	235118570529	9
15. Parvathy J.	235118519510	9
16. Pradeep Sankar	235118500234	8
17. Srethy M.R.	235118550516	10
18. Sneha S.S.	235118578946	9
19. Yashu Krishnan R.S.	235118561126	8
20. Aarsha Sathash	235118560338	10
21. Aditya A.	235118536743	9
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33. Lekshmi A.K	235118575757	10

34	Lekshmi S.S.	235118574016	10
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47	Aarvind M. Raj	235118546153	9
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52	J.D. Haripriya	235118559736	9
53	Aiswarya Krishna	115118524092	10



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2018-19

Molecular Spectroscopy.



# ATTENDANCE REGISTER FOR THE MONTH OF 2018

SI No \_\_\_\_\_ Name \_\_\_\_\_

Absent  
 Present  
 Sick  
 Holiday  
 Leave  
 Other

Sl No	Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34			
1	Abhinav G R	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
2	Amal Kashwan	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
3	Amritha B S	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
4	Amritha MB	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
5	Anjanat AV	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
6	Anjana M/g	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
7	Aparna S	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
8	Bharat's kumar	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
9	Jithin Jji	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
10	Kanya M. Eju	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
11	Keerthana RS	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
12	Monisha M	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
13	Mithun Raj I	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
14	Neethu J A	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
15	Ravathy J	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
16	Pradeep Sankar	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
17	Seethy S S	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
18	Surya S S	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
19	Vadyl kashwan RS	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
20	Aarsha Santosh	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
21	Aathya A	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
22	Athil S	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
23	Anesh SR	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
24	Anoop M	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
25	Arunima Chandan	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
26	Athira Anil	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
27	Baalush MS	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
28	Devika Venu J	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
29	Gowind GS	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
30	Gracehara G	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
31	Jithin MV	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
32	Kallyani M	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
33	Lekshmi AK	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
34	Lekshmi SS	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Absent 86.6%  
 Present 90%  
 Sick 90%  
 Holiday 90%  
 Leave 90%  
 Other 90%

Avg 98.3%  
 Devika 98.6%  
 Anoop 97.1%  
 Athira 97.1%  
 Gracehara 99%  
 Jithin 99%  
 Kallyani 99%  
 Lekshmi 99%



# ATTENDANCE REGISTER FOR THE MONTH OF .....

Sl. No.	Name	Designation	Contract	Date																												Working Days	Days present	Days absent	Leave taken	Remarks
				1/10/18	2/10/18	3/10/18	4/10/18	5/10/18	6/10/18	7/10/18	8/10/18	9/10/18	10/10/18	11/10/18	12/10/18	13/10/18	14/10/18	15/10/18	16/10/18	17/10/18	18/10/18	19/10/18	20/10/18	21/10/18	22/10/18	23/10/18	24/10/18	25/10/18	26/10/18	27/10/18	28/10/18					
35	Megha M Nair	235118515376	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	99.3	High	
36	Neeleha Lakshmi RJ	235118548320	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	99	Med	
37	Nikhil Rajaram	235118527693	ab	ab	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	98.1	Med	
38	Rajikrishna RC	235118561819	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	99	Med	
39	Reshma S Nair	235118556305	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	98.1	Med	
40	Sareekshmi R	235118501115	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	100	Med	
41	Southy S	235118524624	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	98.1	Med	
42	Sudheesh S	235118527774	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	99.1	Med	
43	Syama MS	235118516517	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	100	Med	
44	Vinoda VS	235118508098	ab	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	98.1	Med	
45	Amritha RV	235118538348	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	100	Med	
46	Anusha Raj	235118536117	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	98.91	Med	
47	Aarvind M Raj	235118546153	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	95.1	Med	
48	Fathima SN	235118535514	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	97.1	Med	
49	Hanikrishnan V	235118526060	X	ab	ab	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	99.1	Med	
50	Krishnanunni VS	235118522246	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	95.1	Med	
51	Krishnapriya R	235118501405	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	96.1	Med	
52	J-D-Hanipriya	235118559436	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	96.1	Med	
53	Anusuya Krishna	115118524092	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	96.1	Med	

HEAD  
P.G. Dept. of Chemistry & Research Centre  
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Thiruvananthapuram

P.G. Deputy  
P. Manoj  
Thiruvananthapuram





**MAHATMA GANDHI COLLEGE**  
DEPARTMENT OF CHEMISTRY  
CERTIFICATE OF COMPLETION

*This is to certify that Keerthana R. S has successfully completed the Add On course entitled*

***“ molecular spectroscopy”***

Dr. Simi C.K.  
Course coordinator

Dr. Sikha T.S  
Head of the Department

31/03/2019

HEAD  
RESEARCH CENTRE

P.G. Dept. of Chemistry  
Mahatma Gandhi College  
Thiruvananthapuram



**MAHATMA GANDHI COLLEGE**  
DEPARTMENT OF CHEMISTRY  
CERTIFICATE OF COMPLETION

*This is to certify that Maneesha M has successfully completed the Add On course entitled*

**“ MOLECULAR SPECTROSCOPY”**

Dr. Simi C.K.  
Course coordinator

Dr. Sikha T.S  
Head of the Department

31/03/2019

HEAD OF DEPARTMENT  
P.G. Dept. of Chemistry  
Mahatma Gandhi College  
Thiruvananthapuram

**SUMMARY REPORT OF ADD-ON COURSE – MOLECULAR SPECTROSCOPY (2018-2019)**

Add-on course on Molecular Spectroscopy was successfully completed. In the academic year 2018-2019, fifty three students were enrolled for the course. Classes were conducted from 01/08/2018 to 22/02/2019 for 30 hours. Theory and practical sessions were included in this course. A hand on training was given to students and the practical session was very useful for the students.

After the completion of the course, students were assessed by written examination. Those who secured 60% marks and above in written examinations were honoured by certificates .



**HEAD**

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