Course Details

Name of the Courses:

Sl. No.	Course Name	Course Code	Level (UG/PG/Diploma)	No. of Contact hours/week	Credit
1.	Instrumental Method of Analysis	BP701T	UG	12	4
2.					
3.					
4.					

Course Outcomes:

Course Name: Instrumental Method of Analysis

CO 1. Understand the interaction of matter with EMR and its application in drug analysis

CO 2. Understand the chromatographic separation and analysis of drug

CO 3. Perform quantitative & qualitative analysis of drugs using analytical instruments.

CO 4.

CO 5.

CO 6.

Mapping of Course Outcome (COs) to Program Outcome POs)

Course Outcomes (COs)	Program Outcome POs)									
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10

Text Books:

1. Instrumental Method of Analysis by B.K. Sharma
2. Vogel's textbook of quantitative chemical analysis by A.I Vogel
3. Spectrophotometric identification of organic compounds by Silverstein

Reference Books:

1.
2.
3.
4.

Content Delivery Methodology:

Course Outcomes	Delivery Methods	Supporting Tools
CO1	Offline and Practical experiments	
CO2	Offline and Practical experiments	
CO3	Both offline and online	

Assessment Protocol:

Course Outcomes	Bloom's Taxonomy Level	Assessment Tools

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List of Experiments

Course Name: Instrumental Method of Analysis Course Code: BP705P

Semester/Year: 7th Weekly Contact Hours: 3 hrs No. of Batches: 2

Expt. No	Name of the Expt.
01.	To perform the assay of Paracetamol tablet by standard curve method.
02	To perform the assay of paracetamol tablet by absorptivity method
03	To determine the absorption maxima & the effect of solvents on absorption maxima of given organic compound
04	To determine the standard curve of riboflavin by using spectrophotofluorimeter.
05	Estimation of quinine sulphate by using spectrophotofluorimeter
06	To determine the effect of quenching on quinine sulphate
07	To perform the assay of allopurinol tablet and to find the λ_{max} of given solution using UV spectrophotometer
08	To interpret the IR spectra of given sample
09	To compare the IR spectra of marketed furosemide tablets and pure furosemide.
10	To perform the TLC of supplied sample and detect the spot in UV fluorescence chamber.

List of Experiments

Course Name: Instrumental Method of Analysis Course Code: BP705P

Semester/Year: 7th Weekly Contact Hours: 3 hrs No. of Batches: 2

Expt. No	Name of the Expt.

Teaching-Learning Plan

Program Level & Semester/Year: B. Pharm 7th (UG)

No. of classes per week: 4 hrs

Lecture No.	Unit / Chapter	Syllabus Topics to be Covered
01	I	Electronic transitions associated with UV-visible spectroscopy.
02	I	Introduction of chromophores and auxochromes. spectral shifts
03	I	Solvent effect on absorption spectra. Derivation of Gus's Lambert's law. deviations.
04	I	Instrumentation of UV-Vis spectroscopy. Discussion on applications.
05	I	Theory of fluorimetry. Concepts of singlet, doublet and triplet electronic states.
06	I	Factor affecting fluorescence and quenching
07	I	Instrumentation and applications of fluorimeter
08	II	Introduction to IR spectroscopy and fundamental modes of variations in polyatomic molecules.
09	II	Types of vibrations associated with IR detectors and applications.
10	II	Instrumentation of IR. Discussion on IR detectors and applications.
11	II	Principle of flame photometry and interferences.
12	II	Instrumentation and applications of flame photometry
13	II	Principle of AAS and interferences associated with it
14	II	Instrumentation and application of AAS
15	III	Introduction to chromatography and types of it
16	III	Elaborate absorption and partition column chromatography
17	III	Methodology and techniques of packing of column
18	III	Advantage and disadvantage of Column Chromatography

Teaching-Learning Plan

Course & Code: B Pharm BP701T

Academic Session: 2020-21 Section: A

Mode of Delivery Used	Text / Ref. Book / e-Resource	Date of Lecture		Remarks	Signature of Principal
		Scheduled	Actual		
Black board	Instrumental methods of Chemical analysis by H.H. Sharma.	07/09/2020	07/09/2020		
"	"	09/09/2020	09/09/2020		
"	"	14/09/2020	14/09/2020		
Powerpoint	E-Resource (Slideshare)	21/09/2020	21/09/2020		
Blackboard	Instrumental methods of analysis Chatwal	22/09/2020	22/09/2020		
"	"	23/09/2020	23/09/2020		
"	"	24/09/2020	24/09/2020		
"	"	26/09/2020	26/09/2020		
"	"	28/09/2020	28/09/2020		
"	"	29/09/2020	29/09/2020		
"	"	30/09/2020	30/09/2020		
"	"	5/10/2020	5/10/2020		
"	"	9/10/2020	9/10/2020		
"	"	10/10/2020	10/10/2020		
"	"	12/10/2020	12/10/2020		
"	"	17/10/2020	17/10/2020		
"	"	19/10/2020	19/10/2020		
"	"	24/10/2020	24/10/2020		

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Teaching-Learning Plan

Program Level & Semester/Year: B.Pharm 7th sem(UG)

No. of classes per week: 4 hours

Lecture No.	Unit / Chapter	Syllabus Topics to be Covered
19	III	Introduction to TLC, Principle and some common solvent system
20	III	Discussion on common detecting reagents for selective compound : Rf values
21	III	Advantages, disadvantages and application of TLC.
22	II	Difference between Nephelometer and Turbidimeter principle associated with it.
23	II	Instrumentation & application of nephelo turbidemetry
24	III	Introduction to paper chromatography and methodology adopted
25	III	Development techniques of paper chromatography
26	III	Advantages, disadvantages and application of paper chromatography
27	IV	Introduction to electrophoresis and factor affecting electrophoretic mobility.
28	IV	Techniques of paper, gel and capillary electrophoresis
29	IV	Introduction and theory involved in gas chromatography
30	IV	Instrumentation and derivatization of GC.
31	IV	Temperature programming, advantages, disadvantages and applications of Gas Chromatography
32	IV	Introduction, and theory involved in HPLC.
33	IV	Instrumentation, and advantages of HPLC.
34	V	Introduction, classification of Ion Exchange resin.
35	V	Mechanism of Ion exchange process, factor affecting Ion exchange
36	V	Methodology of IEC and its application.

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Teaching-Learning Plan

Course & Code: B. Pharm; BP701T

Academic Session: 2020-21 Section: A

Mode of Delivery Used	Text / Ref. Book / e-Resource	Date of Lecture		Remarks	Signature of Principal
		Scheduled	Actual		
Blackboard	Instrumental Methods of Analysis by Willard Merritt Dean	09/10/2020	29/10/2020		
"	"	31/10/2020	31/10/2020		
"	"	2/11/2020	2/11/2020		
"	"	7/11/2020	7/11/2020		
"	"	9/11/2020	9/11/2020		
"	"	14/11/2020	14/11/2020		
"	"	16/11/2020	16/11/2020		
Powerpoint	e-resource (Slideshare.net)	21/11/2020	21/11/2020		
Blackboard	Instrumental methods of Analysis by Chatwal	23/11/2020	23/11/2020		
"	"	24/11/2020	24/11/2020		
"	"	26/11/2020	26/11/2020		
"	"	28/11/2020	28/11/2020		
"	"	30/11/2020	30/11/2020		
"	"	2/12/2020	2/12/2020		
"	"	4/12/2020	4/12/2020		
"	"	7/12/2020	7/12/2020		
"	"	9/12/2020	9/12/2020		
"	"	11/12/2020	11/12/2020		

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Teaching-Learning Plan

Program Level & Semester/Year: B. Pharm 7th Sem (VII)

No. of classes per week: 4 hrs

Lecture No.	Unit / Chapter	Syllabus Topics to be Covered
37	V	Introduction to Gel Chromatography and Theory involved.
38	V	Instrumentation and application of Gel Chromatography
39	V	Introduction to Affinity Chromatography and theory involved
40	V	Instrumentation and application of Affinity Chromatography

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Teaching-Learning Plan

Course & Code: B. Pharm, 701T

Academic Session: 2020 – 21

Section: A

Mode of Delivery Used	Text / Ref. Book / e-Resource	Date of Lecture: Scheduled	Date of Lecture: Actual	Remarks	Signature of Principal
Blackboard	Instrumental Method of Chem. Analysis by B.K. Sharma	14/8/2020	14/8/2020		21
"	"	16/8/2020	16/8/2020		21
"	"	17/12/2020	17/12/2020		21
"	"	18/12/2020	18/12/2020		21

THEORY / GPAT

CLASS ATTENDANCE

Program: Semester/Year: Section: Course: No. of Classes per week:

Sl. No.	Roll No.	Name of Students	Prev No. / %	1	2	3	4	5	6	7	8	9	10	11	12
				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	1	Abhigyan Bora		1	A	2	3	A	4	5	6	7	8	9	10
2	2	Abhijit Kalita		A	1	2	3	4	A	A	5	6	7	8	9
3	3	Abhinash Bhowary		A	A	A	A	1	2	A	A	A	A	A	3
4	4	Adiba Qureshi		A	1	2	3	4	5	6	7	8	9	10	11
5	5	Ajay Das		A	1	2	3	4	A	A	5	6	7	8	9
6	6	Ambarish Bhardwaj		1	2	3	4	5	A	A	6	7	8	9	10
7	8	Arun Kumar		A	A	1	2	3	A	A	A	4	5	6	7
8	9	Anjuma Sultana		1	2	3	4	5	6	7	8	9	10	11	12
9	10	Bhrigu Kalita		A	1	2	3	4	5	6	7	8	9	10	11
10	11	Bali Brahma		A	A	1	2	3	4	5	6	7	A	A	8
11	12	Bhaskarjyoti Kalita		A	1	2	3	4	5	6	7	8	9	10	11
12	13	Bikungsha Hasbary		1	A	2	3	4	A	A	5	6	7	8	9
13	14	Dipesh Choudhury		A	A	1	2	3	4	A	A	A	A	5	6
14	15	Chandrajyoti Bezbaruah		A	A	A	A	1	2	A	3	4	5	6	
15	16	Debaprotim Kaushik		A	A	A	1	2	3	4	A	5	6	7	8
16	17	Debika Sarmah		A	A	A	1	2	A	A	3	4	5	6	7
17	18	Debasri Sarmah		A	A	A	1	2	3	4	5	6	7	8	9
18	19	Deepjyoti Das		A	1	2	A	3	4	5	6	7	8	9	10
19	20	Deepshikha Das		1	2	3	4	5	6	7	8	9	10	11	12
20	21	Dhrubajit Bezbaruah		A	A	1	2	A	3	4	5	6	7	8	A
21	22	Dhritismita Devi		A	1	2	3	4	5	6	7	8	9	10	11
22	23	Dipanjali Debnath		A	A	A	A	A	1	2	3	4	5	A	6
23	24	Dipanwita Biswas		A	A	1	A	A	A	A	2	A	3	4	A
24	25	Ellora Kalita		A	1	2	3	4	5	6	7	A	A	A	8
25	26	Enamul Hussain Khandakar		A	A	A	1	2	3	4	A	5	6	7	A
26	27	Eirupa Baruah		A	A	A	1	2	3	4	5	A	A	A	6
27	28	Farook Abdullah		A	A	A	1	2	A	A	3	A	A	A	4
28	29	Gaurav Jyoti Kalita		A	A	A	1	2	A	A	A	3	4	5	6
29	30	[illegible]		1	A	2	3	4	5	6	A	7	8	9	10
30	31	Gobinda Deb		A	1	2	3	4	5	A	6	7	8	9	10
31	32	Hashibul Hussain		A	A	A	1	2	3	4	5	A	6	7	8
32	33	Himangshu Kalita		A	A	1	2	A	A	A	3	4	5	6	7
33	34	[illegible] Jyoti Kumar		A	1	2	A	A	A	A	A	3	4	5	A
34	35	[illegible] Jyoti Patgiri		1	A	2	3	4	5	6	7	8	9	A	10
		Signature of Teacher													

Sl. No.	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	Total No of Class Attended	% Attendance
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]						
1	11	A	12	13	14	15	16	17	A	18	19	20	21	A	22	23	A	24	25	26	1,2,3,4	
2	A	10	11	A	12	13	14	15	16	17	18	A	A	19	20	21	A	22	23	24	1,2,3,A	
3	A	A	A	A	A	4	A	A	A	5	6	7	A	8	9	10	11	12	13	14	1,2,3,A	
4	12	13	14	15	16	17	18	19	A	20	21	A	A	22	23	24	25	26	27	28	1,2,3,4	
5	10	11	12	13	14	15	A	16	17	18	19	20	21	22	23	24	25	26	27	28	1, , ,2	
6	11	12	13	14	15	16	17	18	19	20	21	22	A	23	24	25	26	27	28	29	1,2,3,4	
7	8	9	10	11	12	13	A	14	15	16	17	18	19	20	21	22	23	24	25	26	1,2,3,4	
8	A	13	14	A	15	16	17	A	18	19	20	21	A	22	23	24	25	26	27	28	1,2,3,4	
9	12	13	14	15	16	A	17	18	19	20	21	22	23	24	25	26	27	28	29	30	A,1,2,3	
10	9	10	11	12	13	14	15	A	A	16	17	A	A	18	19	20	21	A	22	23	1,2,3,A	
11	12	13	14	15	16	17	18	19	20	21	22	23	24	A	25	26	27	28	29	30	1,2,3,4	
12	10	11	12	13	14	15	16	17	18	19	20	21	22	23	A	24	A	25	26	A	1,2,3,4	
13	A	7	8	A	A	9	10	11	12	A	A	13	A	A	14	15	16	17	A	18	1,2,3,4	
14	7	A	8	A	9	A	10	11	A	12	13	14	15	16	17	18	19	20	21	22	1,2,3,4	
15	9	A	10	11	12	13	A	A	14	15	16	A	A	17	18	A	19	20	21	22	1,2,3,4	
16	8	A	9	10	A	11	12	13	14	15	16	A	A	A	17	18	19	20	21	22	1,2,3,4	
17	10	11	12	13	14	15	16	17	A	18	19	A	A	A	20	21	22	A	23	24	1,2,3,4	
18	11	A	12	A	13	14	15	16	17	18	19	20	21	A	22	23	24	25	26	27	1,2,3,4	
19	A	13	14	15	16	17	18	19	A	20	21	A	A	22	23	24	25	26	27	28	1,2,3,4	
20	9	10	11	12	A	A	13	14	A	15	16	17	A	A	18	19	20	21	22	23	1,2,3,4	
21	12	13	14	15	16	17	18	19	A	20	21	22	23	24	25	26	27	28	29	30	1,2,3,4	
22	7	8	9	10	A	11	12	A	A	13	14	15	16	17	18	A	19	20	21	22	1,2,A,3	
23	5	A	6	A	A	A	7	A	A	8	A	9	A	A	A	A	A	A	A	A	.1,2	
24	8	10	11	12	13	14	15	A	16	17	18	19	20	A	21	22	23	24	25	26	1,2,3	
25	8	9	10	11	A	12	13	A	14	A	15	16	A	A	17	18	19	20	21	22	1,2,3,4	
26	7	8	9	10	A	11	12	A	13	14	15	A	A	A	16	17	18	19	20	21	1,2,3,4	
27	5	6	A	7	A	8	9	A	A	10	11	12	A	13	14	15	16	17	18	19	1,2,3,4	
28	7	A	8	9	A	10	A	A	A	12	13	14	A	15	16	A	17	18	A	19	1,2,3,4	
29	A	11	12	13	14	15	16	A	17	18	19	A	20	A	20	A	A	A	A	A	1,2,3	
30	A	11	12	13	14	15	16	17	18	19	20	21	A	A	22	23	24	25	26	27	1,2,3,4	
31	9	10	11	12	13	14	15	16	17	18	19	20	A	A	21	22	23	24	25	26	A,A,1,2	
32	8	9	10	11	12	13	14	A	A	15	A	16	17	18	19	20	21	22	A	23	A	A.
33	A	A	A	A	6	7	8	9	A	A	A	A	A	10	A	A	A	11	A	A	1,2,3,4	
34	11	12	13	14	A	15	16	17	A	18	19	20	A	21	22	23	A	A	24	25	1,2,3,4	

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Azara, Guwahati

THEORY / GPAT

Program: Semester/Year: Section:

Date of Lecture

Sl. No.	Roll No.	Name of Students	Prev No. / %
1	36	Bachibeh Kalita	
2	37	Jintu Das	
3	38	Jiakshare Das	
4	39	Jitul Deka	
5	40	Jore moni Sakia	
6	41	Jyotirmoy Das	
7	42	Kajal Bijak	
8	43	Kalpana Bara	
9	44	Kanchana Sultana	
10	45	Kaushik Saud	
11	46	Keikeshi Sungoh	
12	47	Liza Dutta	
13	48	Maharshi Manab Mahanta	
14	49	Manabendra Pramanik	
15	50	Manash Pratim Kalita	
16	51	Mansika Deka	
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31			
32			

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CLASS ATTENDANCE

Course: No. of Classes per week:

Date of Lecture

Total No of Class	Attended	% Attendance

Record of Internal Assessment and Continuous Evaluation

Semester/Year: Course: Course Code:

Roll No.	Name of Students	Assignments				Sessional Exam			Viva / GD
		A-1	A-2	A-3	A-4	Test-1	Test-2	Test-3	
						~~24~~	~~26~~	0	
1245109 0001		19	17	18		24	26		
02		14	19	20		19	19	20	
03		16	18	17		15	19	17	
04		17	18	17		21	19	18	
05		17	16	19		26	28	26	
06		18	18	17		23	26	19	
08		19	18	20		27	29	23	
09		18	17	18		21	22	23	
10		18	15	19		24	26	21	
11		16	16	17		20	29	16	
12		19	20	19		26	27	22	
13		20	20	19		21	24	20	
14		16	17	17		21	25	13	
15		18	18	19		23	23	19	
16		17	19	18		25	26	20	
17		19	19	19		24	25	0	
18		19	19	19		22	23	0	
19		18	19	18		24	25	15	
20		19	19	16		25	25	16	
21		17	19	17		21	21	9	
22		15	16	15		22	21	9	
24		20	19	19		24	21	11	
25		17	18	19		21	25	9	
26		19	18	18		22	20	0	
27		18	18	18		21	20	0	
28		19	18	18		18	18	0	
29		20	20	19		23	23	0	
30		20	19	18		24	23	13	
31		19	19	19		26	27	0	
32		19	17	20		21	20	0	
33		20	20	19		17	15	0	
34		16	17	16		19	18	8	
35		18	19	19		20	21	0	
36		17	19	18		23	21	12	
37		19	19	19		0	0		

Record of Internal Assessment and Continuous Evaluation

Semester/Year: Course: Course Code:

Roll No.	Name of Students	Assignments				Sessional Exam			Viva / GD
		A-1	A-2	A-3	A-4	Test-1	Test-2	Test-3	
38		18	19	18		25	13	17	
39		19	17	16		22	25	16	
40		18	17	18		19	20	12	
41		19	19	19		24	25	13	
42		14	18	17		0	0	0	
43		17	18	17		27	27	0	
44		17	16	17		21	25	0	
45		18	19	17		26	27	14	
46		19	20	20		27	26	0	
47		18	17	18		14	23	12	
48		15	15	19		25	23	0	
49		18	17	18		22	25	21	
50		19	18	19		14	17	0	
51		18	18	17		26	27	24	
52		17	19	17		23	25	0	
53		17	16	19		26	25	19	
54		18	17	18		23	12	25	
55		18	19	19		28	25	18	
56		18	19	17		26	24	25	
58		17	19	17		26	26	28	
59		17	16	17		25	23	26	
60		19	18	17		19	17	30	
61		18	20	20		18	11	21	
62		18	17	16		25	23	26	
64		18	18	17		15	16	0	
65		16	16	17		16	15	21	
66		19	20	20		25	16	24	
68		20	20	19		26	09	26	
69		16	17	16		27	20	29	
70		18	18	19		24	19	28	
71		18	18	17		24	18	24	
72		16	16	17		14	05	06	
73		19	20	20		21	19	18	
74		20	20	19		23	17	24	
76		16	17	16		27	20	29	

Record of Internal Assessment and Continuous Evaluation

Semester/Year: Course: Course Code:

Roll No.	Name of Students	Assignments				Sessional Exam			Viva / GD
		A-1	A-2	A-3	A-4	Test-1	Test-2	Test-3	
77		18	18	19		23	06	21	
78		18	18	17		20	01	15	
79		16	16	17		18	03	18	
80		19	20	20		24	11	22	
81		20	20	19		21	17	18	
82		16	17	16		26	15	20	
83		18	18	19		24	10	23	
84		17	17	16		19	03	13	
85		20	20	20		22	03	16	
86		18	18	20		25	24	20	
87		16	17	17		26	21	21	
88		19	17	18		26	21	22	
89		20	20	20		28	26	20	
90		20	20	19		27	27	20	
91		16	17	16		23	25	19	
93		18	18	19		22	24	16	
94		18	18	17		26	26	0	
95		19	20	20		21	20	14	
96		18	17	18		23	22	16	
97		18	18	17		25	24	16	
98		16	16	17		15	11	0	
99		19	20	20		25	25	17	
100		19	16	18		24	26	16	
101		16	20	16		21	18	12	
160510011026		19	20	19		26	27	18	
L-01		17	17	20		21	18	12	
L-02		20	18	16		21	20	5	
L-03		18	18	18		19	20	0	
L-04		17	20	18		19	23	14	
L-05		17	19	19		22	19	13	
L-06		20	18	18		23	24	18	
L-07		15	14	16		19	19	13	
L-10		19	20	19		20	19	0	

Teaching Learning Plan

Name of the Course: Instrumental Method of Analysis (Theory) **Course Code: BP701T**
Semester: B. Pharm 7th Sem. **Year: 2020-21**
Name of the Teacher: Mr. Susankar Kushari & Mr. Suman Kumar

Designed Course Outcome:

1. Understand the interaction of matter with electromagnetic radiations and its applications in drug analysis.
2. Understand the chromatographic separation and analysis of drugs.
3. Perform quantitative & qualitative analysis of drugs using various analytical instruments.

Tentative Dates	Syllabus Topics to be Covered	Learning outcome	Contribution to which CO	Mode of Delivery	Assessment Tools (With tentative date of Assessment) for measuring Outcome
Unit I Lecture Aug: 04	Introduction to syllabus			• Lecture with board work.	
Unit I Lectures Aug: 10,11,12,17	Electronic transitions, chromophores, auxochromes, spectral shifts	• Highlight the different electronic transitions. • Discuss the examples of chromophores along with auxochromes, • Explain the spectral shifts.	CO. 1 CO. 2	• Lecture with board work. • Interactive discussion • Lecture handouts	
Unit I Lectures Aug: 17, 18,19	Solvent effect on absorption spectra, Beer and Lambert's law, Derivation and deviations	• Describe the effect of solvents on absorption spectra. • Derivation of Beer Lambert's law	CO. 2	• Lecture with board work. • Interactive discussion • Lecture handouts	
Unit I Lectures Aug: 24,25,26	Instrumentation - Sources of radiation, wavelength selectors, sample cells Detectors:	• Discuss instrumentation and applications of UV-Vis spectroscopy	CO. 3 CO. 4	• Lecture with board work. • Interactive discussion	

	Photo tube, Photomultiplier tube, Photo voltaic cell. Silicon Photodiode along with applications.			• Lecture handouts	
Unit I Lectures Sep: 1,2,3	Theory, Concepts of singlet, doublet and triplet electronic states, internal and external conversions	• Discuss the principle associated with fluorimetry. • Elaborate concepts of singlet, doublet and triplet electronic states.	CO. 1 CO. 3 CO. 4	• Lecture with board work. • Interactive discussion	
Unit I Lectures Sep: 8,9,10,15	Factors affecting fluorescence, quenching, instrumentation and applications	• Explain factors affecting fluorescence intensity. • Discuss the instrumentation and applications of spectrofluorimeter.	CO. 1 CO. 2	• Lecture with board work. • Interactive discussion	**1st Class Test** Assessment date: 4th-11th September 2020 **Assignment 1** Assessment date: 19 Aug 2020
Unit II Lectures Sep:21,22, 23	Introduction to fundamental modes of vibrations in poly atomic molecules, sample handling, factors affecting vibrations	• Discuss the principle associated with IR spectroscopy. • Elaborate different vibrations.	CO. 1 CO. 3 CO. 4	• Lecture with board work. • Interactive discussion • LCD projector • Lecture handouts	
Unit II Lectures Sep: 28, 29,30	Instrumentation - Sources of radiation, wavelength selectors, detectors - Golay cell, Bolometer, Thermocouple, Thermister. Pyroelectric detector	• Explain instrumentation and applications of IR spectroscopy	CO. 3 CO. 4	• Lecture with board work. • Interactive discussion • Lecture handouts	

	and applications				
Unit II Lectures Oct:5,6,7	Principle, interferences, instrumentation and applications of flame photometer.	• Discuss the principle of flame photometer. • Explain the different types of interferences. • Discuss the instrumentation and applications.	CO.4	• Lecture with board work. • Interactive discussion • Lecture handouts	
Unit II Lectures Oct:12, 13,14	Principle, instrumentation and applications of nepheloturbidimetry.	• Elaborate the principle of nepheloturbidimetry. • Distinguish between nephelometer and turbidimeter. • Discuss the instrumentation and applications.	CO. 3 CO. 4	• Lecture with board work. • Interactive discussion •	
Unit III Lectures Oct:19,20, 21	Introduction to different types of chromatography. Methodology, advantages, disadvantages and applications of column chromatography.	• Explain the different types of chromatography. • Elaborate the principle associated with adsorption and partition chromatography. • Advantages and disadvantages of column chromatography. • Discuss its applications.	CO. 1 CO. 3 CO. 4	• Lecture with board work. • Interactive discussion • Lecture handouts	
Unit III Lectures Oct:26, 27, 28	Introduction, Principle, Methodology, Rf values, advantages, disadvantages and applications of TLC.	• Discuss the principle of TLC. • Elaborate the advantages and disadvantages of TLC. • Discuss the applications of TLC.	CO. 1 CO. 3 CO. 4	• Lecture with board work. • Interactive discussion Lecture handouts	
Unit III Lectures Nov:2,3,4	Introduction, methodology, development techniques, advantages,	• Discuss the principle of TLC. • Elaborate the advantages and disadvantages of	CO. 1 CO. 3 CO. 4	• Lecture with board work. • Interactive discussion	

	disadvantages and applications of paper chromatography.	paper chromatography. • Discuss the applications of paper chromatography.		• Lecture handouts	
Unit III Lectures Nov:9,10, 11	Introduction, factors affecting electrophoretic mobility, Techniques of paper, gel, capillary electrophoresis, applications.	• Explain the concept of electrophoresis. • Discuss the factors affecting electrophoresis. • Elaborate different techniques of paper, gel and capillary electrophoresis. • Discuss the applications of electrophoresis.	CO. 1 CO. 4	• Lecture with board work. • Interactive discussion • Lecture handouts	**2nd Class Test** Assessment date: 9-16th Nov 2020 **Assignment 2** Assessment date: 12 Nov.
Unit IV Lectures Nov:9,10, 11	Introduction, theory, instrumentation, derivatization, temperature programming, advantages, disadvantages and applications of gas chromatography.	• Explain the principle of gas chromatography. • Discuss the instrumentation and temperature programming. • Elaborate the advantages, disadvantages and applications of gas chromatography.	CO. 1 CO. 3 CO. 4	• Lecture with board work. • Interactive discussion • Lecture handouts	
Unit IV Lectures Nov:16, 17,18	Introduction, theory, instrumentation, advantages and applications of HPLC.	• Discuss the principle of HPLC. • Illustrate the instrumentation of HPLC. • Explain the advantages and applications of HPLC.	CO. 3 CO. 4	• Lecture with board work. • Interactive discussion • Lecture handouts	
Unit IV Lectures Nov:23,24 ,25,27	Introduction, classification, ion exchange resins, properties, mechanism of ion exchange process, factors affecting ion exchange,	• Discuss the classification of ion exchange resin. • Illustrate the mechanism of ion exchange process.	CO. 1 CO. 3 CO. 4	• Lecture with board work. • Interactive discussion	

	methodology and applications	• Elaborate the factors affecting ion exchange process. • Explain the application of IEC.			
Unit IV Lectures Dec:7,8,9	Introduction, theory, instrumentation and applications of gel chromatography.	• Discuss the theory of gel chromatography. • Illustrate the instrumentation of gel chromatography. • Discuss the applications.	CO. 1 CO. 4	• Lecture with board work. • Interactive discussion	3rd **Class Test** Assessment date: 14-21 Dec 2020 **Assignment 2** Assessment date: 7 Dec.
Unit IV Lectures Dec:14,15, 16	Introduction, theory, instrumentation and applications of affinity chromatography.	• Discuss the theory of affinity chromatography. • Illustrate the instrumentation of affinity chromatography. • Discuss the applications.	CO. 1 CO. 4	• Lecture with board work. • Interactive discussion • Lecture handouts	

Submitted by:

Sig:
Subject Teacher

Verified by:

Sig:
Module Co-ordinator

Teaching Learning Plan

Name of the Course: Instrumental Method of Analysis (Practical)
Course Code: BP705P
Semester: B.Pharm 7th
Year: 2020-2021
Name of the Teacher: Mr. Susankar Kushari & Mr. Suman Kumar

Tentative Dates	Syllabus Topics to be Covered	Learning outcome	Mode of Delivery	Assessment Tools (With tentative date of Assessment) for measuring Outcome
Batch D: Aug 11 B: Aug 13	To perform the assay of Paracetamol tablet by standard curve method	• Explain the principle and procedure behind the assay of Paracetamol by standard curve method	• Demonstration of experiments. • Lab manual	• Laboratory Performance. • Viva-voce • Report analysis • Evaluation of practical record Assessment date: On the day of experiment
Batch D: Aug 18 B: Aug 20	To perform the assay of Paracetamol tablet by absorptvity method	• Explain the procedure for performing assay of Paracetamol tablet by absorptvity method	• Demonstration of experiments. • Lab manual	• Laboratory Performance. • Viva-voce • Report analysis • Evaluation of practical record Assessment date: On the day of experiment experiment
Batch D: Aug 25 B: Aug 27	To determine the absorption maxima and the effect of solvents on absorption maxima of given organic compound.	• Explain the principle and procedure of solvent effects on organic compound	• Demonstration of experiments. • Lab manual	• Laboratory Performance. • Viva-voce • Report analysis • Evaluation of practical record Assessment date: On the day of experiment
Batch D: Oct 11 B: Oct 13	To determine the standard curve of	• Explain the procedure for performing the	• Demonstration of experiments	• Laboratory Performance. • Viva-voce

	riboflavin by using spectrofluorimeter .	standard curve of riboflavin by using spectrofluorimeter .	• Lab manual	• Report analysis • Evaluation of practical record Assessment date: On the day of experiment
Batch D: Oct 18 B: Oct 20	Estimation of quinine sulphate by using spectrofluorimeter	• Explain the procedure and principle for the Estimation of quinine sulphate by using spectrofluorimeter	• Demonstration of experiments . • Lab manual	• Laboratory Performance. • Viva-voce • Report analysis • Evaluation of practical record Assessment date: On the day of experiment
Batch D:Oct 25 B: Oct 27	To determine the effect of quenching on quinine sulphate	• Explain the principle of quenching and procedure involved.	• Demonstration of experiments . • Lab manual	• Laboratory Performance. • Viva-voce • Report analysis • Evaluation of practical record Assessment date: On the day of experiment
Batch D: Nov 3 B: Nov 5	To perform the assay of Allopurinol tablets and to find the lambda maxima of the given solution using UV spectrophotometer.	• Explain the procedure for assay of allopurinol tablets.	• Demonstration of experiments . • Lab manual	• Laboratory Performance. • Viva-voce • Report analysis • Evaluation of practical record Assessment date: On the day of experiment
Batch D: Nov 10 B: Nov 12	To interpret the IR spectra of given sample	• Explain the principle of IR spectroscopy and distribution of frequency regions of various functional groups.	• Demonstration of experiments . • Lab manual	• Laboratory Performance. • Viva-voce • Report analysis • Evaluation of practical record Assessment date:

				On the day of experiment
Batch D: Nov 17 B: Nov 19	To compare the IR spectra of marketed furosemide and pure furosemide	• Explain the comparison of IR psectra of marketed furosemide and pure furosemide.	• Demonstration of experiments. • Lab manual	• Laboratory Performance. • Viva-voce • Report analysis • Evaluation of practical record Assessment date: On the day of experiment
Batch D: Nov 25 B: Nov 27	To perform the TLC of supplied sample and detect the spot in UV fluorescence cabinet chamber.	• Explain the procedure for TLC	• Demonstration of experiments. • Lab manual	• Laboratory Performance. • Viva-voce • Report analysis • Evaluation of practical record Assesment date: On the day of experiment
Batch D: Dec 3 B: Dec 5	Isolation of plant pigments by column chromatography	• Explain the procedure for packing of column (wet packing technique)	• Demonstration of experiments. • Lab manual	• Laboratory Performance. • Viva-voce • Report analysis • Evaluation of practical record Assessment date: On the day of experiment
Batch D:Dec 10 B:Dec 12	To demonstrate HPLC instrument	• Explain the instrumentation, principle of HPLC	• Demonstration of experiments • Lab manual	• Laboratory Performance. • Viva-voce • Report analysis • Evaluation of practical record

Submitted by:

Sig:
Subject Teacher

Verified by:

Sig:
Module Co-ordinator

GIRIJANANDA CHOWDHURY INSTITUTE OF PHARMACEUTICAL SCIENCE

1st Sessional Examination

B.Pharm 7th Semester(October, 2020)

Subject: Instrumental Method of Analysis

Subject Code:BP701T

Full Marks:30 **Time:1 hr**

Q.I. Answer all the questions: **1×10=10**

1. The source of light for visible radiation is.....

a) Deuterium lamp
b) Xenon arc lamp
c) Tungsten halogen lamp
d) All of the above

2. Which of the following technique is associated with molecular emission?

a) UV-vis spectroscopy
b) Fluorescence Spectroscopy
c) IR spectroscopy
d) X-ray diffraction

3. The fingerprint region is.....

a) 8-50 μm
b) 1-20 μm
c) 50-100 μm
d) 100-150 μm

4. The type of transition seen in Microwaves is.....

a) Molecular vibration
b) Inner shell electron
c) Molecular rotation
d) Outer shell electron

5. Bathochromic shift means.....

a) Increase in wavelength
b) Increase in intensity
c) Decrease in wavelength
d) Decrease in intensity

6. Hooke's law is associated with.....

a) IR
b) UV-Vis
c) Fluorimetry
d) NMR

7. The C=O stretch value in case of aromatic aldehyde ranges from.....cm^{-1}

a) 2950-2850
b) 3200-3400
c) 1690-1710
d) 3000-3050

8. According to Beer's law the intensity of incident light is directly proportional to.....of the sample

a) Concentration
b) Turbidity
c) Path length
d) Dilution

9. The mid IR ranges from..... cm^{-1}.

a) 12,500-4000
b) 667-50
c) 4000-667
d) None of the above.

10. $n \rightarrow \sigma^*$ is shown by one of the following functional groups.

a) -OH
b) Benzene
c) Alkanes
d) -CHO

Q.II. Answer any two out of three: **2×5=10**

1. Derive Beer-Lambert's law.
2. Proof that A= 2-log %T.
3. Write a short note on Quenching.

Q.III. Answer any one of two: **1×10=10**

1. Write a note on principle and detectors used in UV-Vis spectroscopy.
2. Discuss Jablonski's diagram.

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B. Pharm 7th Semester End Term Examination 2020

Subject: Instrumental Methods of Analysis (BP701T)

Full Marks: 75 **Time: 3 hrs**

A. Answer all **1×20=20**

1. The cathode used in Atomic Absorption Spectroscopy is.....
   a) Sodium
   b) Based on the element
   c) Tungsten wire
   d) Silver wire

2. Silica gel is stable at pH:
   a) 1-5
   b) 6-9
   c) 2-7
   d) None of these

3. The following principle applicable in UV is.....
   a) Molecular vibration
   b) Molecular rotation
   c) Electronic transition
   d) Inner shell transition

4. Thermocouple and Thermopile detectors are composed of.....
   a) Bismuth & antimony
   b) Wheatstone bridge
   c) Oxides of Mn, Co & Ni
   d) Twin dielectric flake

5. Which of the following is an example of strong basic anion exchange resin?
   a) Dolomite
   b) Phenol formaldehyde
   c) Quarternary ammonium compounds
   d) Sulphonated polystyrene

6. In Flame Photometry Barium emitts.....colour under visualisation.
   a) Brick red
   b) Orange
   c) Lime green
   d) Violet

7. In TLC, fluorescent indicator is.....
   a) Zinc stearate
   b) Zinc sulphate
   c) Zinc silicate
   d) None of these

8. Electron capture detector used in GC is composed of.....

a) Selenium
c) Gemenium
b) Oxides of Mn, Co & Ni
d) All of the above

9. The diameter of analytical column used in HPLC is.....

a) 2-4.5 mm
c) 0.25-0.35 mm
b) 50-60 mm
d) 5-6 mm

10. The common reagent for detecting barbiturates in TLC is.....

a) Aniline phthalate
c) Diphenyl carbazone
b) Mercuric nitrate
d) Antimony trichloride

11. The following reagent is used in Gel electrophoresis for protein separation?

a) Comassie blue
c) Alizarin
b) Methylene blue
d) Catechol-violet

12. The most popular thickness of layer in TLC is:

a) 0.5 mm
c) 0.25 mm
b) 0.75 mm
d) 2 mm

13. In reverse phase chromatography mobile phase is.....

a) Polar
c) Non polar
b) Either a) or c)
d) None of the above

14. Weakly acidic cation exchange resins are useful in pH range of:

a) 1-14
c) 5-14
b) 1-12
d) 1-9

15. .....converts sample in mist or aerosol.

a) Nebulizer
c) Detector

b) Atomizer d) None of the above.

16. Fluorescence quenching technique is used to detect that absorb at.....
    a) 280 nm c) 254 nm
    b) 214 nm d) 275 nm

17. The cross-linking agent in ion exchange resin is.....
    a) TEAE c) DEAE
    b) Divinyl benzene d) Dolomite

18. .....is used as stationary liquid phase for non polar solutes in GLC.
    a) Squalene c) Polyethylene glycol
    b) Benzene d) Celite

19. Example of non polar stationary phase is.....
    a) ODS c) PEG
    b) Untreated silica d) CMC

20. Katharometer is.....
    a) HPLC detector c) GC detector
    b) ESR d) HPTLC

B. Answer any seven **5×7=35**

1. With a neat diagram write the working of Photomultiplier tube.
2. Elaborate the interferences of Flame photometry.
3. Write a note on Nepheloturbidometry.
4. What is Electrophoresis? Write the factors affecting Electrophoretic mobility. **2+3=5**
5. What is R_f value? Write some advantages and disadvantages of TLC. **1+4=5**
6. Explain the mechanism of ion exchange in ion exchange chromatography. Mention the factors affecting ion exchange. **2+3=5**
7. Write a short note on Atomic Absorption Spectroscopy.
8. Write a note on working of bolometer.
9. Explain the different vibrations in IR spectroscopy.

C. Answer any two **10×2=20**

1. Define Chromophore and Auxochrome with suitable examples. Explain the different electronic transitions of UV Visible spectroscopy. With diagram explain the working of a double beam UV-Visible spectrophotometer. **2+4+4=10**
2. With Jablonski diagram explain the principle of Fluorescence and Phosphorescence. Mention the factors affecting fluorescence. **4+6=10**
3. Write the principle of HPLC. Write diagram explain different parts and working of an HPLC instrument. **3+7=10**

B. Pharm 7th Semester End Term Examination 2020
Subject: Instrumental Methods of Analysis (BP701T)

Answers to the MCQ questions

A. 1. b
2. c
3. c
4. a
5. c
6. c
7. c
8. b
9. a
10. c
11. a
12. c
13. a
14. c
15. a
16. c
17. b
18. a
19. a
20. c

GIRIJANANDA CHOWDHURY INSTITUTE OF PHARMACEUTICAL SCIENCE
2nd Sessional Examination
B.Pharm 7th Semester(December, 2020)
Subject: Instrumental Method of Analysis
Subject Code:BP701T

Full Marks:30 **Time:1 hr**

Q.I. Answer all the questions: **1×10=10**

1. Laminar flow burner is also called as……..

a) Nozzle mix burner
b) Turbulent burner
c) Premixed burner
d) Total Consumption burner

2. Which of the following is not an application of flame photometry?

a) Assay of metformin
b) To detect metallic ions in sample
c) To estimate Na, Mg & Ca
d) To determine Ca & Mg in cement.

3. In flame emission photometer……..is used for qualitative analysis.

a) Colour
b) Intensity
c) Both a) & b)
d) None of the above

4. Which of the following is an advantage of grating monochromator?

a) Dispersion is non-overlapping
b) Dispersion is linear
c) Dispersion is overlapping
d) Dispersion is non-linear

5. At what pressure should be the gases sealed in a tube to be maintained in Hollow cathode lamp?

a) 1-5 torr
b) 20-50 torr
c) 5-20 torr
d) 50-100 torr

6. Boltzman equation is associated with……..

a) Flame photometry
b) IEC
c) AAS
d) NMR

7. In AAS ……..is used as an anode.

a) Tungsten
b) Element to be investigated
c) Selenium
d) Germanium

8. Ion exchange process is also called as.....

a) Dimeralization
b) Zeolite process
c) Permutit's process
d) Perkin's process

9. The residual hardness after the treatment of water is.....

a) Less than 2 ppm
b) 1 ppm
c) Less than 1 ppm
d) 2 ppm

10. .....is an example of weakly acidic cation exchange resin.

a) Sulphonated polystyrene
b) Phenol formaldehyde
c) Carboxylic polymethacrylate
d) Polyamine polystyrene

Q.II. Answer any two out of three: **2×5=10**

1. Explain the mechanism of Ion exchange chromatography.
2. Write a note on different types of interferences in Flame photometry.
3. Explain the steps in Ion exchange chromatography.

Q.III. Answer any one of two: **1×10=10**

1. Write the Instrumentation & application of Flame photometer.
2. Discuss the different types of Ion exchange resins.

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ASSIGNMENT

TOPIC - GIVE THE METHODOLOGY AND DEVELOPING TECHNIQUES OF PAPER CHROMATOGRAPHY

SUBJECT - INSTRUMENTAL METHODS OF ANALYSIS

SUBMITTED BY

ABHIROP MUKERJEE
B. PHARM 7TH SEMESTER
SEC 'A'
ROLL NO : 04

Paper Chromatography

- Paper chromatography is processed as the separation of sample component carried out on paper.
- Cellulose filtere paper is generally used as stationary phase.
- Here, separation of components occur due to partition mechanism. The solute molecules are distributed between two liquids.

Methodology of Paper Chromatography

- Chromatographic paper of appropriate size and shape is selected. A baseline of 2cm from lower edge is drawn.
- A drop of test solution is applied as a small spot on a paper and the spot is dried.
- Mobile phase is kept in the chamber.
- The paper is placed in the chamber such that the lower edge of the paper is dipped into a solvent (mobile phase)
- Care must be taken so that the base line should not be dipped in mobile phase.
- A lid is kept on top of the chamber.
- Solvent will raise through the paper by capillary action and it reaches the spot of the test solution.
- From this action, the various sample component are moved by solvent system at various speed.
- When solvent has raised to a suitable height, the paper is taken out of the chamber and dried.
- Various spots are visualized by suitable reagents.

• R_f values are calculated for each component of sample i.e, migration parameter by using the formula,

$$R_f = \frac{\text{Distance travelled by solute from base line}}{\text{Distance travelled by solvent from base line}}$$

Development Techniques

• Paper is flexible when compared to glass plate used in TLC.

• The different types of development techniques are as follows:-

1) Ascending Development

• When paper development is done by allowing the solvent to travel up the paper i.e solvent flow against the gravity, it is known as ascending technique.

• Here, the mobile phase is kept in a container at the bottom of the chamber. The sample are applied a few centimeters from the bottom edge of the paper.

2) Descending type development

• When development of paper is done by allowing the solvent to travel down the paper, it is known as descending technique.

• This is carried out in a special chamber where the solvent holder is at the top. The spot is kept at the top.

• The spot is kept at the top and solvent flows down the paper.

• The advantage of this type is that the development is faster.

3) Ascending - Descending Development

- It is a hybrid of both ascending and descending technique.
- only length of separation is increased, first ascending takes place followed by descending.

4) Circular / Radial Development

- In this type, a circular filter is used. Then the various material to be analysed are placed at the centre.
- After drying the spot, the paper is fixed horizontally on a petri-dish containing the solvent so that the tongue of the paper dips into the solvent.
- The paper is covered by means of petri dish cover. The solvent rises through the tongue.
- when the solvent has moved through a sufficient distance, the components get separated.

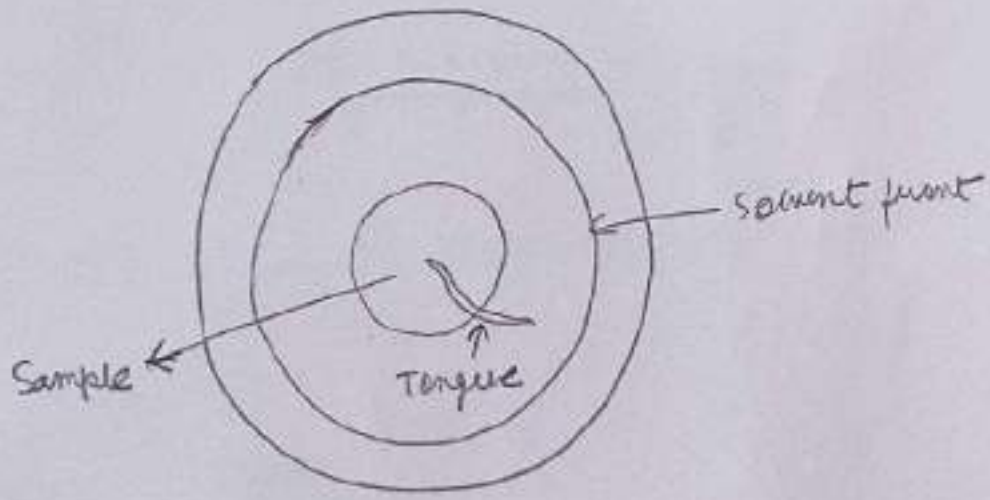


Fig: Radial paper Chromatography

ASSIGNMENT

TOPIC :- Give the methodology and developing techniques of paper chromatography.

Subject :- Instrumental Methods of Analysis

Submitted by :

Abhishek Kumar Jha

B. Pharm 7th Semester

Sec - 'A'

Roll No. - 06.

Paper Chromatography

In paper chromatography, separation of sample component is carried out on paper. The cellulose filter paper is often used as stationary phase.

In this techniques separation of sample components occur due to partition mechanism. The solute molecules are distributed between two liquids.

Methodology of paper Chromatography

1) Chromatographic paper of appropriate size and shape is selected. A base line of 2cm from lower edge is drawn.

2) A drop of test solution is applied as a small spot on a paper and the spot is dried.

3) Mobile phase is kept in the chamber

4) The paper is placed in the chamber in such a way that lower edge of paper is dipped into a solvent.

5) Care must be taken so that the base line should not dipped in mobile phase.

6) A lid is kept on top of the chamber.

7) Solvent will raise through the paper by capillary action and it reaches the spot by of the test solution.

8) From this action the various sample component are moved by the solvent system at various speed.

9) When solvent has raised to a suitable height, the paper is taken out of the chamber and dried.

10) Various spot are visualized by suitable reagents.

11) Rf values are calculated for each component of sample. i.e migration parameter by using the formula.

$$R_F = \frac{\text{Dist travelled by solute from baseline}}{\text{Dist travelled by solvent from base line}}$$

Development technique.

- Paper is flexible when compared to glass plate used in TLC

The different types of development tehnique are.-

1) Ascending Development (go up)

when the development of the paper is done by allowing dips into the solvent. The paper is covered by means of petri

the solvent to travel up the paper i.e. solvent flow against the gravity, it is known as ascending technique

Here, Mobile phase is kept in a container at the bottom of the chamber. The sample are applied on few centimeter from the edge of the paper.

2) Descending type (a downward slope)

When the development of the paper is done by allowing the solvent to travel down the paper, it is known as descending technique.

This is carried out in a special chamber where the solvent holder is at the top. Spot is kept at the top & the solvent flows down the paper.

3) Ascending - descending development

It is a hybrid of the above two technique. Only length of separation increased, first ascending takes place followed by descending.

4) Circular / Radial development

In this type, a circular filter is used, then the various mixtures to be analysed are placed at the center. After drying the spot, the paper is fixed horizontally on a petri-dish containing the solvent so that the tongue of the paper dips into the solvent. The paper is covered by the means of a petri-dish

dish cover. The solvent rises through the tongue. When solvent front has moved through a sufficient distance the component get separated.

ASSIGNMENT

TOPIC - Give the methodology & developing techniques of paper chromatography

SUBJECT - INSTRUMENTAL METHOD OF Analysis

SUBMITTED BY - Abhishek Das

Roll - 5

B.Pharm 7th Sem

Sec A

Paper Chromatography

Paper chromatography is a technique used to separate phytochemical components. The cellulose filter is used as stationary phase. Separation occurs due to partition mechanism.

Methodology

- Chromatographic paper of appropriate size and shape is selected. A baseline of 2 cm from lower edge is drawn.
- A drop of test solution is applied as a small spot on a paper and the spot is dried.
- Mobile phase is kept in the chamber.
- The paper is placed in the chamber in such a way that lower edge of the paper is dipped into a solvent (mobile phase)
- Care must be taken so that the base line should not dipped in mobile phase.
- A lid is kept on top of the chamber.
- Solvent will rise through the paper by capillary action and it reaches the spot of the test sam.
- From the action the various sample component are moved by solvent system at various speed.
- When solvent has raised to a suitable height, the paper is taken out of the chamber and dried.
- Various spot are visualized by suitable reagents.
- Rf values are calculated for each component of sample by -

$$Rf = \frac{\text{Dist. travelled by solute from base line}}{\text{Dist. travelled by solvent from base line}}$$

Development Techniques

1) Ascending Development :- When the development of the paper is done by allowing the solvent to travel up the paper. In here the mobile phase is kept in a container at the bottom of the chamber. The sample is applied few centimeters from bottom edge.

2) Descending type :- When the development of the paper is done by allowing the solvent to travel down the paper. Carried out in a spherical chamber where the solvent holder is at top. The spot is kept at the top & solvent flows down the paper.

3) Ascending - Descending Development :- It is a hybrid of the 2 above technique. Only length of separation increased, first ascending followed by descending.

4) Radial Development :- Here, a circular filter is used. The material to be analysed are placed at centre. After drying the spot, paper is fixed horizontally on a petri dish containing the solvent so that the tongue of the paper dips into the solvent. The paper is covered by means of petri dish cover. The solvent rises through the tongue. When solvent front has moved through a sufficient distance, the component gets separated.

ASSIGNMENT ON INSTRUMENTAL METHOD OF ANALYSIS

Topic :- Give the methodology and developing techniques of paper chromatography

Name- Anumav Krishna Murty Barmah
Roll no - 11
B. Pharm, 7th Sem

Paper Chromatography:-

In paper chromatography, separation of sample component is carried out on paper. The cellulose filter paper is often used as stationary phase.

In this technique separation of sample components occurs due to partition mechanism. The solute molecules are distributed between two liquids.

Methodology of Paper chromatography:

1) Chromatographic paper of appropriate size and shape is selected. A baseline of 2 cm from lower edge is drawn.
2) A drop of test-solution is applied as a small spot on a paper and the spot on a paper and the spot is dried.
3) Mobile phase is kept in the chamber.
4) The paper is placed in the chamber in such a way that lower edge of the paper is dipped into a solvent (mobile phase).
5) Care must be taken so that the base line should not dipped in mobile phase.
6) A lid is kept on top of the chamber.
7) Solvent will rise through the paper by capillary action and it reaches the spot of the test solution.

8) From this action the various sample components are moved by solvent system at various speed.

9) When solvent has reached to a suitable height, the paper is taken out of the chamber and dried

10) Various spot are visualized by suitable height, the paper is taken out of the chamber and dried

11) Rf values are calculated for each component of sample i.e, migration parameter by using the formulae;

$$R_f = \frac{\text{Dist. travelled by solute from base line}}{\text{Dist. travelled by solvent from base line}}$$

Development technique

- Paper is flexible when compared to glass plate used in TLC.

The different types of development technique are:-

1) Ascending Development (going)

When the development of the paper is done by allowing the solvent to travel up the paper i.e, solvent flow against the gravity.

Here, the mobile phase is kept in a container at the bottom of the chamber. The sample are applied a few centimeters from the bottom edge of the paper.

2) Descending type (downward slope) :-

When the development of the paper is done by allowing the solvent to travel down the paper, it is known as Descending type.

Special chamber is needed where solvent holder is at the top. The spot is kept at the top and the solvent flows downwards.

3) Ascending - descending development:-

It is hybrid of the above two techniques. Only lengthy separation mixtures, first ascending takes place followed by descending.

4) Circular / Radial development:-

In this type, a circular filter is used. When the various material to be analysed are placed in the center. After drying the spot, the paper is fixed horizontally on a petridish containing the solvent so that the tongue of the paper dips into the solvent. The solvent rises through the tongue. When solvent front has moved through the tongue. When solvent front has moved through a sufficient distance the component is separated.

GIRIJANANDA CHOWDHURY INSTITUTE OF PHARMACEUTICAL SCIENCE

Assignment on Instrumental Method Of Analysis

Topic: Give the methodology and developing techniques of Paper Chromatography

Submitted to-

Mr. Susankar Kushari

Faculty, GIPS

Submitted by-

Name- Bhabana Kalita

Class- B Pharm 7th, Sem (A)

Roll no- 190510011017

Paper Chromatography -

It is a technique in which separation of an unknown substance is mainly carried out by the flow of solvents on the specially, designed chromatographic filter paper.

• Methodology -

In methodology of paper chromatography practical requirements as follows -

1) Paper as stationary phase.
2) Preparation of paper.
3) Preparation of sample.
4) Application of the sample.
5) Mobile phase as developing solvent.
6) Chromatographic chamber.
7) Development of chromatogram.
8) Drying of chromatogram.
9) Location of spot.
10) Quantitative analysis.
11) Elution.

1) Paper as stationary phase -

- For paper chromatography Whatman filter paper is used.
- This paper contains α-cellulose 98-99%, β-cellulose 0.3-1%, ether soluble matter 0.015-0.02%, mineral content 0.01-0.07%, besides this ammonia and lipophilic substance are also present.
- Choice of filter paper depends upon thickness, flow rate, purity and technique.

2) Preparation of paper -

- As grade and type of paper decided for separation, it is cut in desired size and shape.
- After deciding the direction of run on paper, origin line marked on paper.

3) Preparation of sample -

- It is important to choose proper solvent for making solution.
- Generally in mobile phase sample solution is prepared or in volatile solvents.

4) Application of the sample -

- Prepared sample applied through capillary or micropipette on origin line marked on paper.
- Very low concentration is used to avoid large zone.
- Generally size of spot should be as small as possible.

5) Mobile phase as developing solvent -

- The selection of mobile phase depends mainly on nature of sample to be separated.
- Factors should be considered at the time of selection of mobile phase like viscosity, polarity.

6) Chromatographic chamber -

- Glass chromatographic chamber is preferred for paper chromatography.
- Length of chamber depending upon length and breadth of paper and type of development.

7) Development of chromatogram -

- At the time of development of paper, paper dipped in solvent in such a way that the spot will not dip completely into the solvent.

- The solvent will run over paper by capillary action.
- After complete development paper is carefully taken out of chamber.

8) Drying of chromatogram -
- Simple hair dryer is a convenient to dry chromatograms.
- They also dried by cold or hot air depending on volatility of solvents.

9) Location of spot -
- After drying of chromatogram next step is to detect developed spots of separated samples.
- If substance are coloured easily detected visually, but for detecting colourless spots various methods are use -

(a) Physical method -
E.g - Iodine chamber, UV chamber for fluorescent compound.

(b) Chemical method -
Eg - Amino acids - Ninhydrin in acetone.
Alkaloids - Dragendroff's reagent.

10) Methods of quantitative analysis -
(a) Measurement of spot length.
(b) Planimetric measurement
(c) Method of Counting squares.
(d) Weighing the Excised Spot.
(e) Method of Visual Comparison.

11) Elusion -
- The section of the developed filter paper is cut out and eluted with an appropriate solvent such as ethanol or chloroform
- The elute is then made up to volume and measured in a spectrophotometer or colorimeter and compared with a standard of known concentration.

• Development Techniques –

In paper chromatography various development techniques were employed to increase ease and efficiency of operation. They are –

1) Ascending development.
2) Descending development.
3) Ascending - Descending development.
4) Circular / Radial / Disk development
5) Two dimensional development.

1) Ascending development –

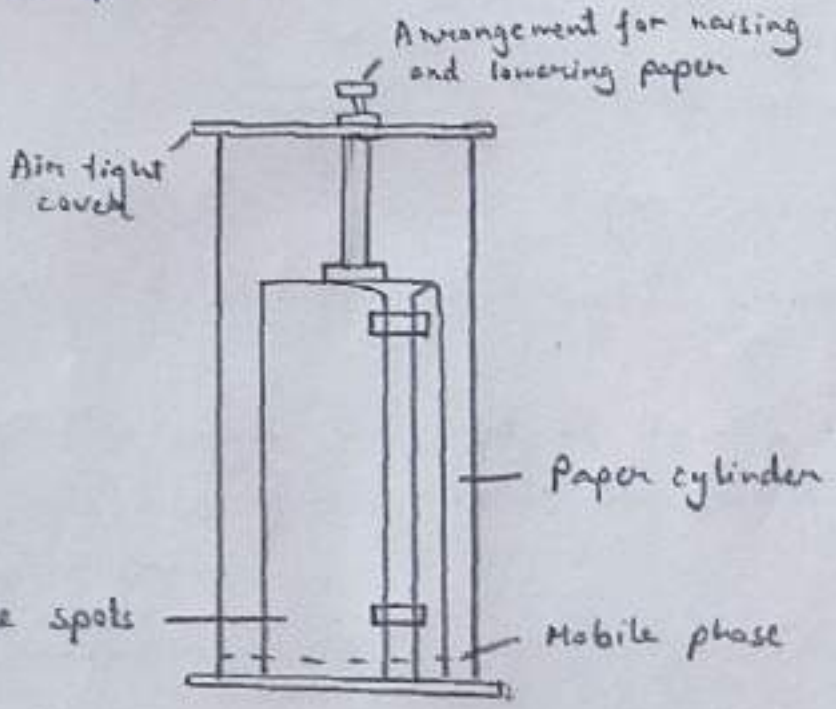


Fig: Apparatus for ascending paper chromatography

- In this technique mobile phase flows against gravity means upward direction of chromatographic paper.
- The origin line made at the bottom of the paper.
- Samples drop put on origin line and allow to air dry.
- Chromatographic chamber filled with mobile phase and saturates it with vapours of mobile phase.
- Prepared paper hangs in chromatographic chamber with thread or

held together by staples on plastic clips.

2) Descending development -

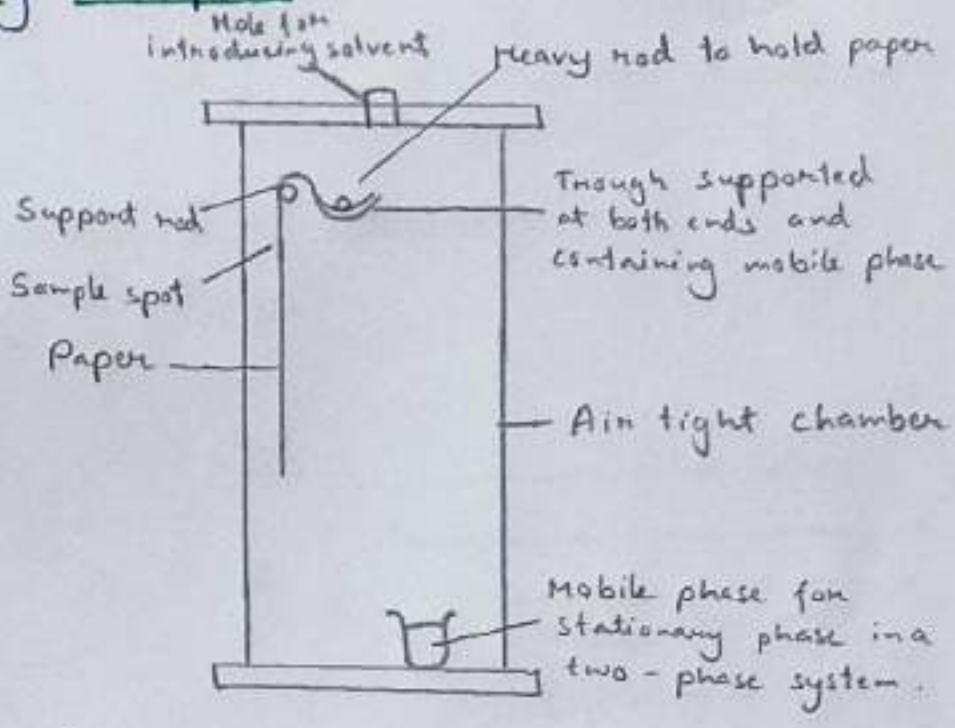


Fig: Apparatus for descending Paper Chromatography

- This is carried out in special chamber where solvent held at the top.
- The sample spot on origin line kept at the top of paper and mobile phase flows with gravity means downward direction of chromatographic paper.
- Rate of development is faster.

3) Ascending - Descending development -

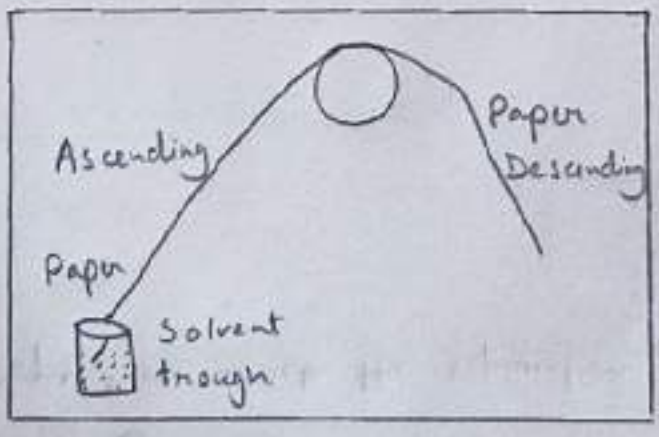


Fig: Ascending - Descending development

- This is a combination of ascending and descending type.
- The length of paper is increased and length of separation also increased by using combination of techniques.
- First ascending takes place followed by descending development.

4) Circular / Radial / Disk development -

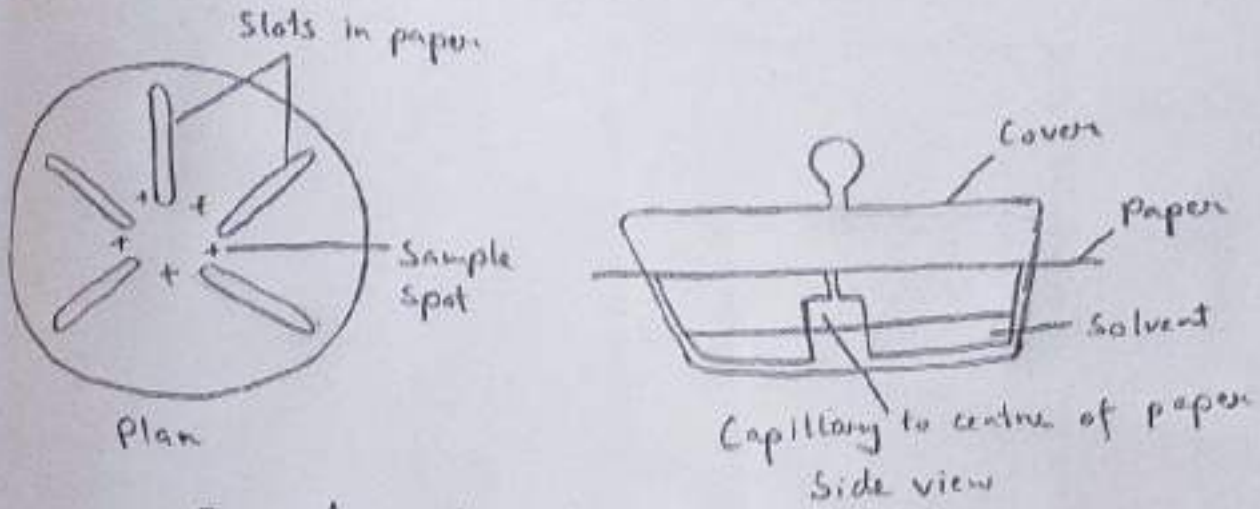


Fig: Apparatus for circular Paper Chromatography

- In this technique a circular chromatographic paper is used.
- This paper has a wick cut from centre of the paper, sample spot is applied on upper end of wick.
- The paper is then placed on edge of circular disk with wick dipping into the solvent at the bottom of the disk.

5) Two-dimensional developments -

- It is specially suitable when Rf values are very close or nearly the same.
- In this technique square or rectangular chromatographic paper is used.
- The sample is applied to one of the corners.

GIRIJANANDA CHOWDHURY UNIVERSITY

ASSIGNMENT ON

INSTRUMENTAL METHOD OF ANALYSIS

Topic:- Methodology and Development Techniques of paper chromatography.

Submitted to:
- Sir. Sushankar Kuthari
- Assistant Professor GCU
- Department of pharmaceutical Chemistry

Submitted by:
~ Evaline Mylliemngap
~ Roll-no : 1905100111029
~ B.Pharm 7th Semester
Section - A
~ Date: 5/12/22

Q. Give the methodology and developing techniques of paper chromatography.

INTRODULCTION:- Paper chromatograpy was first introduced by the German scientist, Christian Friedrich Schonbein in 1865.

- It is a type of a planar chromatography. It is the simplest and widely used type of chromatography procedures which runs on a specialized paper.

Principle - This technique is a type of partition chromatography in which the substances are distributed between two liquids, i.e one is the stationary liquid (usually water) which is held in the fibres of the paper and called the stationary phase; the other is the moving liquid or developing solvent and called the moving phase. The components of the mixtures to be separated migrate at different rates and appear as spots at different points on the paper.

- Originally paper chromatography was used to seperate mixtures of organic substances such as dyes and amino acids only. But now this method has been perfected to separate cations and anions of inorganic substances as well.

- In this technique, a drop of the test solution is applied as a small spot on a filter paper and the spot is dried. The paper is kept in a closed chamber and the edge of the filter paper is dipped into a solvent called developing solvent. As soon as the filter paper gets the liquid through its capillary axis and when it reaches the spot of the test solution, the various substances are moved by solvent system at various speeds. When the solvent has moved

then cation to a suitable height (15-18 cm) the p
is dried and various spots are visualised by suita
reagents called visualising reagents. The movements
substances relative to the solvent is expressed in te
of R_f values i.e. migration parameters.

Types of Paper Chromatography

(a) Descending Chromatography: When the developme
the paper is done by allowing the solvent t
vel down the paper, it is known as descen
technique. The apparatus consists of a well -
glass tank of suitable size and shape which -
provided with a trough for the mobile p
in the upper portion. The paper with the samp
is inverted with the upper end in the trough c
ning the mobile phase, the jar itself having
equilibrated with the mobile phase prior to el

(b) Ascending Chromatography:- When the developme
the paper is done by allowing the solvent to a
up the paper, it is known as ascending techniq
In ascending chromatography, the mobile phase -
in a suitable container at the bottom of the chambe
the chamber itself. The samples are applied a few
ters from the bottom edge of the paper suspended
a hook.

(c) Ascending - Descending Chromatography:- It is the
of the above two technique. In this technique, t
part of the ascending chromatography can be fold
a glass rod allowing the ascending development to
over into the descending after moving the glass ro

(d) Radial Paper Chromatography:- This is also known as
circular paper chromatography. In this technique a
circular filter paper is used and the various material to
be analysed are placed at the centre.

(e) Two - dimensional Chromatography: In this, a square
or rectangular paper is used. The sample is applied to
one of the corners. The second development is performed
at right angle to the direction of the first run.
This type of chromatography can be carried out with
identical solvents systems as in the two directions or
by two solvent system.

METHODOLOGY:

(a) Choice of the Proper Chromatographic Technique:-
- The first job is to select the mode of paper chro-
matographic technique i.e. ascending, descending, ascending-
descending, radial or two-dimentional technique.
- The choice of technique depends upon the nature of
the substances to be separated.

(b) Choice of the filter paper:-
- The filter paper plays an important role in the success
of paper chromatography. The choice of paper depends
on the type of problem under investigation.
Whatmann filter papers are commonly used.

(c) Proper Developing Solvent: The best possible developing
solvents is generally selected for the separation of substances
under examination. The choice of this depends upon the
simple fact that R_f values should be different of
different constituents present in a mixture.

(d) Preparation of Samples :- It is not possible to ... any standard procedure for preparation of samples ... because this problem revolves around several fac... of the given samples, especially the presence of o... system like fats, salts, protein etc.

(e) Spotting : For ascending technique, a strip of ... mann filter paper of suitable size (25cm x 7cm) is ge... used. A horizontal line is drawn on the ... paper by a lead pencil. This line is known ... origin line. On the origin line, cross mark... are made with a pencil in such a way t... each cross is at least 2cm away from ea... other.

By the help of a graduate micro pipette ... test solutions are applied on cross mark and ... spots are dried cautiously by a stream of he... cold air.

(f) Drying the Chromatography :- The wet chroma... ~~plate~~ after development are dried in special d... cabinets which are being heated electrically. wi... temperature controls.

(g) Visualisation :-

Visualisation of the spots can be done in ... ways:

(i) Either by chemical means or

(ii) By using physical method.

(i) Chemical Detection : Chemical treatment can develop the colour of colourless spots on the paper. The reagents used for visualising the spots are known as chromato-gric reagents and visualising reagents.

(ii) Physical Methods : Some colourless spots, when held under a UV lamp, fluoresce and reveal their existence. When the substance is coloured, the spots can be observed either by reflected or transmitted light.

(h) Calculation of R_f values : The distance of chroma-tographed species is noted from its centre to the origin line. The distance of solvent front from the origin line gives the R_f values.

ASSIGNMENT

ON

INSTRUMENTAL METHOD OF ANALYSIS

Topic:- Methodology AND Development techniques of paper chromatography

Submitted By:-

- Name:- Koyal Sarkar
- Roll No:- 19051001104
- Semester:- B.pharm 7th semester
- Branch:- B.pharmacy.
- Date:- 5-12-22
- University:- Girijananda chowdhury University (GCU).

Submitted to:-

→ Mr. Sushankar Kushari (Sir).
→ Assistant professor of GCU.
→ Department of pharmaceutical chemistry.

Give the Methodology and developing techniques of paper chromatography.

Introduction of paper chromatography:-

→ paper chromatography was first introduced by German scientist Christian Friedrich Schonbein (1865). It is a partition-chromatography and liquid-liquid chromatography.

→ paper chromatography is considered to be the simplest and most widely used of the chromatographic techniques because of its applicability to isolation, identification and quantitative determination of organic and inorganic compounds.

→ paper chromatography is an analytical method used to seperate colored chemicals or substances.

Types of paper chromatography - There are 2 types of paper chromatography, they are:-

(1) Paper adsorption chromatography:- paper impregnated with silica or alumina acts as adsorbent (stationary phase) and solvent as mobile phase.

(2) Paper partition chromatography:- Moisture/water present in the pores of cellulose fibres present in filter paper acts as stationary phase and another mobile phase is used as solvent.

Methodology of paper chromatography:-

→ If the substance are colored they are visually detected easily.

→ But for colorless substance, physical and chemical methods are used to detect the spot.

(a) Non-specific methods (physical methods)

→ Eg:- Iodine-chamber method.

→ UV chamber for fluorescent compounds - at 254 or at 365nm.

(b) Specific Methods (chemical methods) or spray method — examples:—

- Ferric chloride
- Ninhydrin in acetone.
- Dragendorff's reagent
- 3,5 dinitrobenzoic acid.
- phenolic comp. and tar
- Amino acids.
- Alkaloids.
- cardiac glycosides

(c) Direct measurement Method:—

(i) comparison of visible spots—

→ A rough quantitative measurement can be carried out by comparing the intensity and size of the spot with a standard substance.

(ii) photo densitometry—

→ This method is used with the chromatograms of colored compound. Instrument measures quantitatively the density of spots.

(iii) Fluorimetry— → The compound to be measured by fluorimetry must be fluorescent or convertible into fluorescent derivatives.

(iv) Radiotracer Method—

→ The compound containing radioactive element is labeled and treated with locating reagent. Using 'Geiger Muller counter.

(v) polarographic and Conductometric method—

→ used to measure the amount of material in the spot.

Indirect Measurement Method—

→ In this technique, the spots are cut into portions and eluted with solvents. The solutions can be analyzed by any techniques of analytes like spectrophotometry, electrochemical methods, etc.

* The various steps involved in paper chromatography are:—

(1) Selection of stationary phase (filter paper):—

→ The stationary phase used in paper chromatography is water which get absorbed on a special type of paper made up of 98-99% cellulose fibres (α-cellulose). Other constituents (1%) includes β-cellulose, pentosan, ash, ammonia, Nitrogen etc.

→ cellulose fibres is surrounded by a film of moisture, moisture or water molecules constitute about 22% by weight of paper.

→ various types of whatmann chromatography papers are available. Choice of whatmann paper depends on type of seperation.

→ coarser and faster paper (whatman (ZIFT).
It is used when substances to be seperated have sufficiently wide apart Rf.

→ Slow papers (whatmann 20).
It is used for better resolution of substance with close Rf values.

→ Heavy paper (whatmann 3mm).
It is generally used for preparative purposes.

* The choice of filter paper depends upon:—

(a) Type of analytes → qualitative or quantitative.
(b) Reason for analysis → analytical or preparative.
(c) Nature of the sample — hydrophilic, hydrophobic, neutral

* After selecting or appropriate filter paper cut into required shape (square, rectangular or semicircular) base line is drawn with pencil about 2-3cm above the edge of paper and sample is applied over this line.

(2) Selection of solvent system (mobile phase).

→ The mobile phase is generally a mixture of one or more polar organic solvents or salts and water (single phase solvent preffered).

→ Solvent system is taken in a clean dry closed vessel preferably, a glass tank Cylindrical or rectangular shape closed saturate.

→ The choice of solvent system depends the following criteria:-

(a) Solvent system should be inert. It should not react with paper and sample.

(b) The ratio of solvent system should change with time.

(c) It should be of suitable viscosity, surface tension and density.

Sample to be analyzed

Amino acids

Sugars

Halide
(F^-, Cl^-, Br^-, I^-)

· Mobile phase

n-butanol: Acetic acid: water
(4:1:5)

ethyl acetate: water
(2:1:2).

pyridine: water
(9:1).

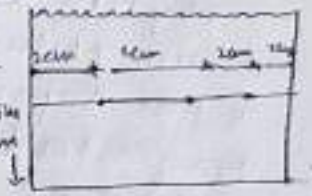
(3) Preparation and Application of sample -

→ There is no standard procedure for preparation of sample if sample is solid then dissolved in suitable volatile solvent.

→ About 2-10µl of sample is applied as spots.

→ By help of graduated micropipette sample are applied spots are dried by a stream of hot or cold air.

(4) Development of chromatogram -



Suitable solvent system is placed in development tank.

covered it with a lid to saturate environment of tank.

the spotted paper is placed into the tank with its spotted end dipping into solvent (spot are kept slightly above the level of solvent) (paper should not touch the sides of tank).

the solvent now travel upon paper due to capillary action.

Solvent dissolves the constituents of sample which travels upwards according their individual partition co-efficients.

when solvent travels about 3/4th of the paper development is stopped by removing paper. the developed paper is known as chromatogram.

the chromatogram is immediately marked with pencil at distance travelled by solvent (known as solvent front). The paper is allowed to dry in open air or heated chamber.

(5) Visualisation of chromatogram:—

(a) Chemical Detection:— Chemical treatment develop colour of colourless spots on paper. The reagents used for visualising are known as chromatogenic reagents or locating agents.

Reagent	Mixture
Ninhydrin solution	Amino acids.
Aniline phthalate	Sugars
Iodine vapour	organic bases
Dragendorff's reagent	Alkaloids.
Bromocresol green	Acids.

(b) Physical methods — Some colourless spots when placed under UV lamp. fluorence, reveal their existence.

(6) Calculation of migration parameters:—

R_f = Distance travelled by solute from origin / Distance travelled by solvent from origin

R_x = Distance travelled by the substance from origin / Distance travelled by standard substance from origin

$$R_M = \log\left(\frac{1}{R_f} - 1\right).$$

Development Techniques —

→ paper is flexible when compared to glass plate used in TLC. Several types of development are possible which increases the ease of operation.

→ The paper is dipped in solvent in such a manner that the spots will not dip completely into the solvent.

→ The solvent will rise up and it is allowed to run 2/3rd of paper height for better and efficient Result.

→ It takes from several minutes to several hours

Different type of Development techniques —

(A) Ascending Development
(B) Descending Development
(C) Ascending - Descending Development
(D) Circular / Radial Development
(E) Two dimensional Development

Find, here, we have described the different type of development techniques:—

ASSIGNMENT ON INSTRUMENTAL METHOD OF ANALYSIS

Topic :- Methodology And Development techniques of paper chromatography

Submitted to :-
- Mr. Susankar Kushari (sir)
- Assistant professor of CGU
- Department of pharmaceutical chemistry

submitted by :-
- Name :- Madhusmita Paul
- Roll no :- 19051001104 9
- semester :- B. Pharm, 7th Sem
- Branch :- B. Pharmacy
- Date :- 5-12-22

Give the methodology & developing techniques of Paper Chromatography.

The various steps involved in paper chromatography are:

(1) Selection of stationary phase (filter paper):-

* The stationary phase used in paper chromatography is water which get absorbed on a special type of paper made up of 98.99% cellulose fibers (α-cellulose) other constituents (about 1%) includes β-cellulose, pentosons, ash, ammonia, nitrogen etc.
* Cellulose fiber is surrounded by a film of moisture. Moisture or water molecules constitute about 22% by weight of paper.
* Various types of whatmann chromatography papers are available. Choice of whatmann paper depends on type of separation.
* Coarser and faster paper (whatmann 1FT)
  It is used when substances to be separated have sufficiently wide apart Rf
* Slow papers (whatmann 20)
  It is used for better resolution of substances with close Rf values.
* Heavy paper (whatmann 3mm) →
  It is generally used for preparative purposes.
* The choice of filter paper depends upon-
  (a) Type of analysis → qualitative or quantitative
  (b) Reason for analysis → analytical or preparative
  (c) Nature of the sample → hydrophilic, hydrophobic, neutral or

* After selecting an appropriate filter paper it is cut into required shape (square, rectangular or circular) Base line is drawn with pencil about 2-3cm above the edge of paper and sample is applied over this line.

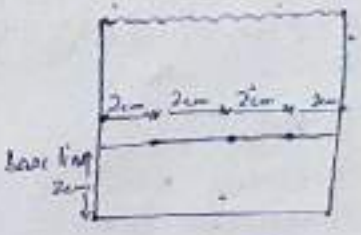
(2) Selection of Solvent System (Mobile phase):-

* The mobile phase is generally a mixture of one or more polar organic solvents, buffer or salt and water (Single phase solvent are preferred)
* Solvent system is taken in a clean and dry closed vessel preferably a glass tank of cylindrical or rectangular shape closed to saturate.
* The choice of Solvent System depends upon the following criteria:
  (a) Solvent system should be inert. It should not react with paper and sample.
  (b) The ratio of Solvent system should not change with time
  (c) It should be of suitable viscosity surface tension and density.

Sample to be analyzed	Mobile phase used
Amino Acids	n-butanol : Acetic acid : water (4 : 1 : 5)
Sugars	Ethyl acetate : pyridine : water (2 : 7 : 2)
Halides (F^-, Cl^-, Br^-, I^-)	Pyridine : water (9 : 7)

3) Preparation and Application of sample:-

* There is no standard procedure for preparation of sample. If sample is solid then dissolved in suitable volatile solvent.
* About 2-10 µl of sample is applied as spots.
* By help of graduated micro pipette sample are applied. Spots are dried by a stream of hot or cold air.



4) Development of Chromatogram:-

Suitable solvent system is placed in development tank.

Covered it with a lid to saturate environment of tank.

The spotted paper is placed into the tank with its spotted end dipping into solvent (Spots are kept slightly above the level of solvent) (Paper should not touch the sides of tank)

The solvent now travel up on paper due to capillary action.

Solvent dissolves the constituents of sample which travels upwards according to their individual partition coefficients.

(The system should not be disturbed once development starts)

When solvent travels about 3/4th of the paper development is stopped by removing paper. The developed paper is known as chromatogram.

The chromatogram is immediately marked with pencil at distance travelled by solvent (known as solvent front). The paper is allowed to dry in open air or heated chamber.

5) Visualization of chromatogram:

a) Chemical Detection: chemical treatment can develop colour of colourless spots on paper.

The reagents used for visualising spots are known as chromatogenic reagents or visualising reagents or locating agents.

Reagent	Mixture
Ninhydrin solution	Amino acids
Aniline phthalate	Sugars
Iodine vapour	Organic bases
Dragendorff's reagent	Alkaloids
Bromocresol green	Acids

b) Physical Methods: Some colourless spots when placed under UV lamp, fluorescence reveal their existance.

(6) Calculation of Migration Parameters:

$R_f = \frac{\text{Distance travelled by solute from origin line}}{\text{Distance travelled by solvent from origin line}}$

$R_x = \frac{\text{Distance travelled by the substance from origin}}{\text{Distance travelled by standard substance X from origin}}$

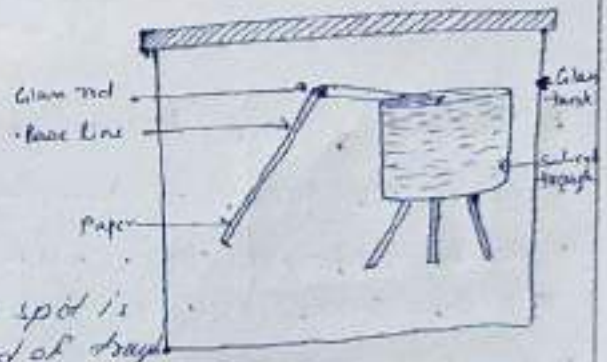
$R_m = \log\left(\frac{1}{R_f} - 1\right)$

Development Techniques:-

* Depending upon the nature of components to be separated any one of the following may be opted:-

(1) Descending Chromatography:-

When development of the paper is done by allowing the solvent to travel down the paper, it is known as descending technique.

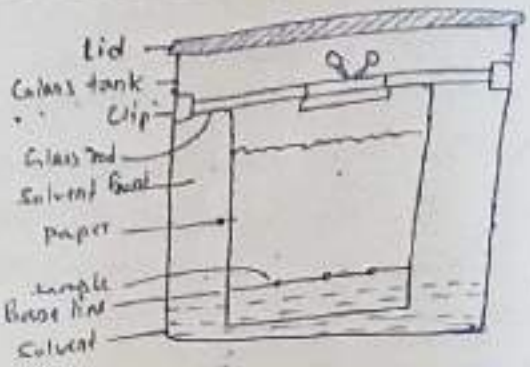


* The container consist of a well sealed glass tank of suitable size.
It provided with trough for the mobile phase.
* The paper with sample spot is inserted with the upper end of trough containing mobile phase
* The advantage of this is that the development can be continued indefinitely even though solvent run off at the other end of paper.

(2) Ascending Chromatography:-

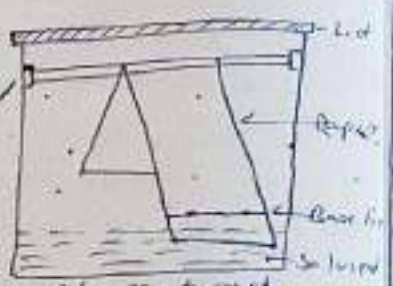
When development of the paper is done by allowing the solvent to travel up the paper it is known as ascending technique.

* In ascending chromatography, the mobile phase is placed in a suitable container at the bottom of the chambers.
The samples are applied a few cm. from bottom edge of the suspended paper.
* The ascending technique is preferred if Rf values of various constituents are almost same.



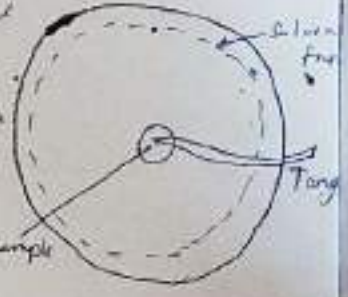
3) Ascending and descending Chromatography :-

* It is the hybrid of ascending and descending techniques
* In this technique upper part of ascending chromatogram can be folded over a glass rod.
* allowing ascending development to change into the descending development after crossing glass rod.



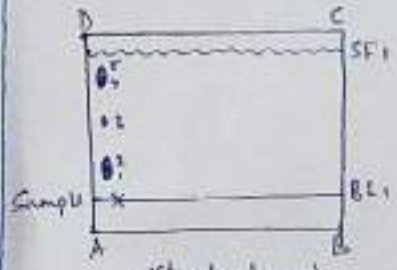
4) Radial Paper Chromatography :-

* It is also known as Circular paper Chromatography
* It is used Radial development.
* In this technique a circular filter paper is used.
* Various materials to be analysed are placed at the center and dried
* The paper is fixed horizontally in a petridish.
* The paper is placed such that the lower end of the wick at the tongue touches the Solvent.
* The petridish is then covered and solvent ascends the wick by capillary action.
* The Solvent may also be applied continuously over the dried spot with the capillary tube.
* When Solvent front has moved a sufficient large distance
* Components get separated in the form of Concentric circular zones

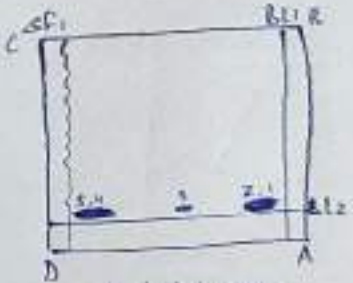


5) Two dimensional Chromatography :-

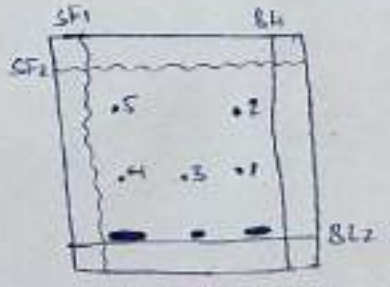
* In this - a square or rectangular paper is used
* Sample is applied to one of the corners
* Second development is performed at right angle to the direction of the first run.
* This type of chromatography can be carried out with identical solvent system in both direction or by two Solvent systems



1st development



Rotated paper



2nd development

GIRIJANANDA CHOWDHURY INSTITUTE OF PHARMACEUTICAL SCIENCE

PROGRAM :	BACHELOR OF PHARMACY (B. PHARM) (New Curriculum - 2017)		
UNIVERSITY :	Assam Science & Technology University		
NAME OF THE SUBJECT :	Theory:	Instrumental Method of Analysis	
SUBJECT CODE :	Theory:	BP701T	
SESSION :			Aug - December 2020
NAME OF THE TEACHER(S) :			Mr.Susankar Kushari & Mr.Suman Kumar

COURSE OUTCOME ASSESSMENT SHEET

ROLL NO	Theory			Theory								
	NO OF CLASSES	NO OF CLASSES ATTENDED	ATTENDANCE	SESSIONAL (30)				CONTINUOUS EVALUATION (20)				ESE
				1ST SES	2ND SES	3RD SES	AVG	CE 1	CE2	CE3	AVG	
170510011001	40	35	88	24	26	0	25	18	17	18	17.7	B
170510011002	40	37	93	26	27	23	27	19	19	20	19.3	A
170510011003	40	35	88	21	18	0	20	18	19	17	18.0	A
170510011004	40	37	93	22	19	18	21	17	18	17	17.3	C
170510011005	40	38	95	26	28	26	27	17	16	17	16.7	A
170510011006	40	38	95	23	25	19	24	18	18	17	17.7	D
170510011008	40	36	90	27	27	23	27	19	18	20	19.0	A
170510011009	40	34	85	21	22	23	23	18	17	18	17.7	B
170510011010	40	37	93	24	26	21	25	18	18	17	17.7	A
170510011011	40	38	95	20	24	16	22	16	16	17	16.3	B
170510011012	40	35	88	25	27	22	26	19	20	19	19.3	B
170510011013	40	36	90	26	24	20	25	20	20	19	19.7	B
170510011014	40	38	95	21	25	13	23	16	17	17	16.7	D
170510011015	40	35	88	23	23	14	23	18	18	19	18.3	B
170510011016	40	37	93	25	26	20	26	17	19	18	18.0	B
170510011017	40	36	90	24	25	0	25	19	19	19	19.0	A
170510011018	40	36	90	22	23	0	23	19	19	19	19.0	B
170510011019	40	38	95	24	25	15	25	18	19	18	18.3	C
170510011020	40	37	93	25	25	16	25	18	17	16	17.0	B
170510011021	40	38	95	22	21	9	22	17	18	17	17.3	B
170510011022	40	37	93	22	21	9	22	15	16	15	15.3	C
170510011023	40	35	88	24	21	11	23	20	19	19	19.3	C

Susankar Kushari
SIGNATURE OF THE TEACHER

ROLL NO	Theory						Theory								
	NO. OF CLASSES HELD	NO. OF CLASSES ATTENDED	ATTENDANCE				SESSIONAL (30)				CONTINUOUS EVALUATION (20)				GRADE
							1ST SES	2ND SES	3RD SES	AVG	CE 1	CE 2	CE 3	AVG	
17051001M025	40	35	88				21	25	9	23	17	18	19	18.0	B
17051001M026	40	37	93				22	20	0	21	18	18	18	18.0	B
17051001M027	40	34	85				21	20	0	21	18	18	18	18.0	B
17051001M028	40	32	80				18	18	0	18	20	20	19	19.7	A
17051001M029	40	36	90				23	23	0	23	20	19	18	19.0	A
17051001M030	40	37	93				24	23	13	24	19	19	19	19.0	A
17051001M031	40	35	88				26	27	0	27	19	17	20	18.7	A
17051001M032	40	31	78				21	20	0	21	20	20	19	19.7	A
17051001M033	40	34	85				17	15	0	16	16	17	16	16.3	B
17051001M034	40	36	90				19	18	0	19	18	18	19	18.3	B
17051001M035	40	35	88				20	21	0	21	17	19	18	18.0	A
17051001M036	40	37	93				20	21	12	21	19	19	19	19.0	C
17051001M037	40	36	90				0	0	0	0	19	19	19	19.0	D
17051001M038	40	37	93				25	27	17	26	18	19	18	18.3	C
17051001M039	40	38	95				23	25	16	24	18	17	16	17.0	D
17051001M040	40	36	90				19	20	12	20	18	17	18	17.7	D
17051001M041	40	38	95				24	25	13	25	19	19	19	19.0	B
17051001M042	40	38	95				0	0	0	0	18	19	17	18.0	D
17051001M043	40	37	93				27	27	0	27	17	18	17	17.3	
17051001M044	40	35	88				21	25	0	23	17	16	17	16.7	D
17051001M045	40	36	90				26	27	14	27	18	18	17	17.7	C
17051001M046	40	38	95				24	23	12	24	19	20	20	19.7	B
17051001M047	40	37	93				27	26	0	27	18	17	18	17.7	B
17051001M048	40	35	90				23	23	0	23	15	15	14	14.7	C
17051001M049	40	37	93				27	28	21	28	18	17	18		D
17051001M050	40	36	90				17	17	0	17	19	19	19	19.0	D
17051001M051	40	36	90				26	27	24	27	18	19	17	18.0	B
17051001M052	40	35	88				23	24	0	24	17	18	17	17.3	B
17051001M053	40	36	90				26	25	19	26	17	16	17	16.7	C

SIGNATURE OF THE TEACHER

ROLL NO	Theory: NO. OF CLASSES HELD	Theory: NO. OF CLASSES ATTENDED	Theory: ATTENDANCE				Theory: SESSIONAL (30): 1ST SES	2ND SES	3RD SES	AVG	CONTINUOUS EVALUATION (20): CE1	CE2	CE3	AVG	ESE	B
170510011054	40	37	93				23	12	25	24	18	17	18	17.7	C	
170510011055	40	36	90				28	26	28	28	19	19	19	19.0	A	
170510011056	40	37	93				26	24	25	26	18	19	17	18.0	D	
170510011058	40	38	95				26	26	28	27	17	18	17	17.3		
170510011059	40	36	90				25	23	26	25	17	16	17	16.7	A	
170510011060	40	38	95				19	17	30	25	18	18	17	17.7	B	
170510011061	40	38	95				19	11	21	20	19	20	20	19.7	F	
170510011062	40	37	93				25	23	26	26	18	17	18	17.7	A	
170510011064	40	35	88				15	16	0	16	18	18	17	17.7	D	
170510011065	40	36	90				16	15	21	19	16	16	17	16.3	B	
170510011066	40	38	95				25	16	24	25	19	20	20	19.7	A	
170510011068	40	37	93				26	9	26	26	20	20	19	19.7	C	
170510011069	40	36	90				27	20	29	28	16	17	16	16.3	B	
170510011070	40	37	93				24	14	28	26	18	18	19	18.3	B	
170510011071	40	36	90				20	14	24	22	18	18	17	17.7	B	
170510011072	40	36	90				19	5	6	13	19	20	20	19.7	D	
170510011073	40	35	88				21	9	19	20	18	17	18	17.7	C	
170510011074	40	36	90				23	7	25	24	18	18	17	17.7	B	
170510011076	40	37	93				27	20	29	28	16	16	17	16.3	A	
170510011077	40	36	90				23	6	21	22	19	20	20	19.7	C	
170510011078	40	37	93				20	1	15	18	20	20	19	19.7	C	
170510011079	40	38	95				18	1	18	18	16	17	16	16.3	C	
170510011080	40	36	90				24	11	22	23	18	18	19	18.3	B	
170510011081	40	38	95				21	17	18	20	17	17	16	16.7	C	
170510011082	40	38	95				26	15	20	23	20	20	20	20.0	B	
170510011083	40	37	93				24	10	23	24	19	18	20	19.0	A	
170510011084	40	35	88				19	3	13	16	16	17	17	16.7	F	
170510011085	40	36	90				22	3	16	19	19	17	18	18.0	D	
170510011086	40	38	95				25	24	29	27	20	20	20	20.0	D	

SIGNATURE OF THE TEACHER

ROLL NO	Theory			Practical			Theory												
	NO. OF CLASSES HELD	NO. OF CLASSES ATTENDED	ATTENDANCE	NO. OF CLASSES HELD	NO. OF CLASSES ATTENDED	ATTENDANCE	SESSIONAL (30)				CONTINUOUS EVALUATION (20)				ESE	CONTINUOUS ASSESSMENT (20)	SESSIONAL	ESE GP
							1ST SES	2ND SES	3RD SES	AVG	CE 1	CE 2	CE 2	AVG				
170510011087	40	37	93				26	27	21	27	18	18	17	17.7			0	
170510011088	40	36	90				26	27	22	27	16	16	17	16.3	A		0	
170510011089	40	37	93				28	26	20	27	19	20	20	19.7	A		0	
170510011090	40	38	95				27	27	20	27	20	20	19	19.7	A		0	
170510011091	40	36	90				23	25	19	24	16	17	18	16.3	C		0	
170510011093	40	38	95				22	24	16	23	18	18	19	18.3	A		0	
170510011094	40	38	95				26	26	0	26	18	18	17	17.7	C		0	
170510011095	40	37	93				21	20	14	21	19	20	20	19.7	B		0	
170510011096	40	35	88				23	22	16	23	18	17	18	17.7	D		0	
170510011097	40	36	90				25	24	16	25	18	18	17	17.7	B		0	
170510011098	40	38	95				15	14	0	15	16	16	17	16.3	F		0	
170510011099	40	37	93				25	25	17	25	19	20	20	19.7	A		0	
170510011100	40	36	90				24	26	16	25	19	16	18	17.7	A		0	
170510011101	40	37	93				21	18	12	20	16	20	16	17.3	D		0	
160510011126	40	36	90				26	27	18	27	19	20	19	19.3	D		0	
180550011001	40	36	90				23	22	17	23	17	17	20	18.0	C		0	
180550011002	40	35	88				21	20	15	21	20	18	16	18.0	D		0	
180550011003	40	36	90				19	20	0	20	18	18	18	18.0	B		0	
180550011004	40	37	93				19	23	17	21	17	20	18	18.3	D		0	
180550011005	40	36	90				18	19	13	19	17	19	19	18.3	B		0	
180550011006	40	37	93				23	24	18	24	20	18	18	18.7	C		0	
180550011007	40	38	95				19	19	13	19	15	14	16	15.0	D		0	
180550011010	40	36	90				20	19	0	20	19	20	19	19.3	C		0	
										0							0	
										0							0	
										0							0	
										0							0	
										0							0	
										0							0	

SIGNATURE OF THE TEACHER

ASSESSMENT REPORT

PROGRAM :	GIRIJANANDA CHOWDHURY INSTITUTE OF PHARMACEUTICAL SCIENCE			
UNIVERSITY :	Assam Science & Technology University			
NAME OF THE SUBJECT :	Theory:	Instrumental Method of Analysis		0
SUBJECT CODE :	Theory:	BP701T		0
SESSION :	Aug - December 2020			
NAME OF THE TEACHER(S) :	Mr.Sasankar Kushari & Mr Sumen Kumar			

ASSESSMENT REPORT	ATTENDANCE	ATTENDANCE	SESSIONAL (30)				CONTINUOUS EVALUATION (20)				ESE	CONTINUOUS ASSESSMENT																							SESSIONAL			ESE
			1ST SES	2ND SES	3RD SES	AVG	CE 1	CE 2	CE 3	AVG		EXPT 1	EXPT 2	EXPT 3	EXPT 4	EXPT 5	EXPT 6	EXPT 7	EXPT 8	EXPT 9	EXPT 10	EXPT 11	EXPT 12	EXPT 13	EXPT 14	EXPT 15	EXPT 16	EXPT 17	EXPT 18	EXPT 19	EXPT 20	EXPT 21	EXPT 22	EXPT 23	EXPT 24	1ST SES	2ND SES	AVG	
NO. OF STUDENTS SCORED >= 80%	102	0	46	43	17	51	100	101	101	99	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NO. OF STUDENTS SCORED >= 70%	103	0	78	60	30	79	103	103	103	102	56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NO. OF STUDENTS SCORED >= 60%	103	0	96	78	44	95	103	105	103	102	77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NO. OF STUDENTS SCORED >= 50%	103	0	101	86	59	100	103	103	103	102	97	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NO. OF STUDENTS SCORED 0 - 50%	0	0	2	17	44	32	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

ASSESSMENT REPORT	ATTENDANCE	ATTENDANCE	SESSIONAL (30)				CONTINUOUS EVALUATION (20)				ESE	CONTINUOUS ASSESSMENT																							SESSIONAL			ESE
			1ST SES	2ND SES	3RD SES	AVG	CE 1	CE 2	CE 3	AVG		EXPT 1	EXPT 2	EXPT 3	EXPT 4	EXPT 5	EXPT 6	EXPT 7	EXPT 8	EXPT 9	EXPT 10	EXPT 11	EXPT 12	EXPT 13	EXPT 14	EXPT 15	EXPT 16	EXPT 17	EXPT 18	EXPT 19	EXPT 20	EXPT 21	EXPT 22	EXPT 23	EXPT 24	1ST SES	2ND SES	AVG	
% OF STUDENTS SCORED >= 80%	97	0	44	41	16	49	95	96	96	94	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% OF STUDENTS SCORED >= 70%	98	0	74	57	29	75	98	98	98	97	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% OF STUDENTS SCORED >= 60%	98	0	91	74	42	90	98	98	98	97	73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% OF STUDENTS SCORED >= 50%	98	0	96	82	56	95	98	98	98	97	92	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0
% OF STUDENTS SCORED < 50%	0	0	2	18	42	30	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NO. OF STUDENTS APPEARED	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105
80% OF STUDENTS SCORED	>80%	>70%	>60%	<50%	<50%	>50%	<50%	<50%	<50%	>50%	>50%	<50%	<50%	<50%	<50%	<50%	<50%	<50%	<50%	<50%	<50%	<50%	<50%	<50%	<50%	<50%	<50%	<50%	<50%	<50%	<50%	<50%	<50%	<50%	<50%	<50%	<50%
	100	80	70	0	0	60	0	0	0	100	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

SIGNATURE OF THE TEACHER

WEIGHTAGE CONTRIBUTION TO RESPECTIVE COURSE OUTCOMES

Weightage	100	20					20	10			20	30																												
CO 1		0.2	0	0	0	0	0.2	0.1	0	0	0.2	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		20	0	0	0	0	12	0	0	0	20	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Weightage	100	20					20		10		30	20																												
CO 2		0.2	0	0	0	0	0	0	0.1	0	0.3	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		20	0	0	0	0	12	0	0	0	30	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Weightage	100	20		10			20			10	20	20																												
CO 3		0.2	0	0.1	0	0	0.2	0	0	0.1	0.2	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		20	0	7	0	0	12	0	0	0	20	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Weightage	80	20					20				10	30																												
CO 4		0.2	0	0	0	0	0.2	0	0	0	0.1	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		20	0	0	0	0	12	0	0	0	10	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Weightage	100	20					20	10			20	30																												
CO 5		0.2	0	0	0	0	0.2	0.1	0	0	0.2	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		20	0	0	0	0	12	0	0	0	20	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Weightage	100	30	20							20		30																												
CO 6		0.3	0.2	0	0	0	0	0	0	0.2	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		30	16	0	0	0	0	0	0	0	0	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

ATTAINMENT OF COURSE OUTCOMES

COs	% OF ATTAINMENT	ATTAIMENT LEVEL	REMARKS
CO 1	70	MODERATE	
CO 2	74	MODERATE	
CO 3	71	MODERATE	
CO 4	60	MODERATE	
CO 5	70	MODERATE	
CO 6	64	MODERATE	

SIGNATURE OF THE TEACHER

GIRIJANANDA CHOWDHURY INSTITUTE OF PHARMACEUTICAL SCIENCE

PROGRAM :	BACHELOR OF PHARMACY (B. PHARM) (New Curriculum - 2017)		
UNIVERSITY :	Assam Science & Technology University		
NAME OF THE SUBJECT :		Practical	Instrumental Method of Analysis
SUBJECT CODE :		Practical	BP705P
SESSION :	Aug - December 2020		
NAME OF THE TEACHER(S) :	Mr Susankar Kushari & Mr Suman Kumar		

COURSE OUTCOME ASSESSMENT SHEET

ROLL NO	Practical NO OF CLASSES	Practical NO OF CLASSES	Practical ATTENDANCE		ESE	EXPT 1	EXPT 2	EXPT 3	EXPT 4	EXPT 5	EXPT 6	EXPT 7	EXPT 8	EXPT 9	EXPT 10	EXPT 11	EXPT 12	EXPT 13	EXPT 14	EXPT 15	EXPT 16	EXPT 17	EXPT 18	EXPT 19	EXPT 20	EXPT 21	EXPT 22	EXPT 23	EXPT 24	SESSIONAL 1ST SES	SESSIONAL 2ND SES	SESSIONAL AVG	ESE GP
170510011001	10	10	100	0		17	18	17	19	19	19	18	17	16	18															32	35	34	A
170510011002	10	10	100	0		17	19	18	19	17	19	19	19	20	19															35	39	37	O
170510011003	10	10	100	0		17	19	17	18	17	19	19	17	17	18															33	30	32	B
170510011004	10	10	100	0		18	19	18	17	17	18	19	17	17	19															32	36	34	A
170510011005	10	10	100	0		19	19	17	18	18	17	19	18	17	19															34	38	36	O
170510011006	10	10	100	0		17	17	19	17	19	18	19	17	18	19															36	36	36	A
170510011008	10	10	100	0		17	17	19	18	19	17	18	19	19	19															31	28	30	O
170510011009	10	10	100	0		17	17	18	17	19	18	17	16	17	19															34	38	36	A
170510011010	10	10	100	0		18	18	17	18	19	17	19	17	17	18															32	33	33	O
170510011011	10	10	100	0		19	19	18	19	18	19	19	18	17	17															27	30	29	A
170510011012	10	10	100	0		19	18	17	19	19	19	19	18	17	19															34	38	36	O
170510011013	10	10	100	0		19	19	18	19	17	19	19	19	18	19															31	28	30	A
170510011014	10	10	100	0		19	19	17	18	17	19	18	19	17	18															31	30	31	B
170510011015	10	10	100	0		19	19	18	17	17	18	17	19	18	17															26	28	27	A
170510011016	10	10	100	0		18	19	17	18	18	17	18	19	17	18															29	33	31	A
170510011017	10	10	100	0		17	17	19	17	19	18	17	17	19	17															35	37	36	A
170510011018	10	10	100	0		18	17	19	18	19	17	18	17	19	18															37	38	38	B
170510011019	10	10	100	0		17	17	18	17	19	18	18	17	18	17															38	39	39	A
170510011020	10	10	100	0		18	18	17	18	19	17	18	18	17	18															23	25	24	A
170510011021	10	10	100	0		17	19	18	19	18	19	17	19	18	19															26	23	25	A
170510011022	10	10	100	0		18	18	17	18	19	17	18	17	18	18															23	25	24	A
170510011023	10	10	100	0		17	19	18	19	18	19	18	17	17	18															24	23	23	B

(Practical — CONTINUOUS ASSESSMENT (20) spans EXPT 1–EXPT 24)

SIGNATURE OF THE TEACHER

ROLL NO				Practical: NO OF CLASSES HELD	Practical: NO OF CLASSES ATTENDED	Practical: ATTENDANCE									ESE
170510011025				10	10	100				0					
170510011026				10	10	100				0					
170510011027				10	10	100				0					
170510011028				10	10	100				0					
170510011029				10	10	100				0					
170510011030				10	10	100				0					
170510011031				10	10	100				0					
170510011032				10	10	100				0					
170510011033				10	10	100				0					
170510011034				10	10	100				0					
170510011035				10	10	100				0					
170510011036				10	10	100				0					
170510011037				10	10	100				0					
170510011038				10	10	100				0					
170510011039				10	10	100				0					
170510011040				10	10	100				0					
170510011041				10	10	100				0					
170510011042				10	10	100				0					
170510011043				10	10	100				0					
170510011044				10	10	100				0					
170510011045				10	10	100				0					
170510011046				10	10	100				0					
170510011047				10	10	100				0					
170510011048				10	10	100				0					
170510011049				10	10	100				0					
170510011050				10	10	100				0					
170510011051				10	10	100				0					
170510011052				10	10	100				0					
170510011053				10	10	100				0					

Practical — CONTINUOUS ASSESSMENT (CP)

ROLL NO	EXPT 1	EXPT 2	EXPT 3	EXPT 4	EXPT 5	EXPT 6	EXPT 7	EXPT 8	EXPT 9	EXPT 10	EXPT 11	EXPT 12	EXPT 13	EXPT 14	EXPT 15	EXPT 16	EXPT 17	EXPT 18	EXPT 19	EXPT 20	EXPT 21	EXPT 22	EXPT 23	EXPT 24	SESSIONAL: 1ST SES	SESSIONAL: 2ND SES	SESSIONAL: AVG	ESE GP
170510011025	19	18	19	19	18	15	17	18	19	17															23	28	27	A
170510011026	19	19	19	19	19	17	18	18	17	18															32	34	33	A
170510011027	19	17	19	19	17	16	17	18	17	16															31	33	32	B
170510011028	18	17	19	18	17	18	17	16	17	18															32	33	33	C
170510011029	17	17	18	17	17	17	18	18	16	15															31	33	33	B
170510011030	18	18	17	18	18	17	18	16	15	15															32	25	29	B
170510011031	17	19	18	17	19	19	18	17	17	16															34	36	35	O
170510011032	18	19	17	18	19	17	18	18	18	19															24	30	27	B
170510011033	17	19	18	17	19	19	18	16	17	19															24	26	25	C
170510011034	18	19	17	18	19	17	19	18	19	19															21	25	23	
170510011035	18	17	19	18	18	18	19	17	19	18															32	32	32	B
170510011036	18	17	19	17	19	19	19	17	19	17															26	25	26	B
170510011037	17	17	18	18	19	17	18	17	19	18															30	24	22	
170510011038	18	18	17	17	19	19	17	17	18	17															20	32	31	A
170510011039	17	19	18	18	19	17	18	18	17	18															32	37	36	A
170510011040	18	19	17	15	17	16	17	19	18	17															33	26	25	B
170510011041	17	19	18	18	17	17	18	19	17	18															34	37	36	
170510011042	18	19	17	17	17	18	17	19	18	19															23	20	22	
170510011043	19	19	19	18	18	17	18	19	16	19															21	24	23	O
170510011044	17	19	18	18	18	17	18	19	17	18															23	27	25	A
170510011045	18	19	17	17	17	17	18	19	16	17															23	23	24	O
170510011046	19	19	19	18	18	17	18	17	18	18															24	29	27	A
170510011047	19	17	19	17	17	17	18	19	17	17															35	36	36	A
170510011048	18	17	19	18	18	17	18	17	18	18															20	21	21	B
170510011049	17	17	18	17	17	17	18	19	17	17															32	36	34	O
170510011050	18	18	17	18	18	16	15	15	16	18															36	35	36	
170510011051	18	17	19	18	18	15	15	16	15	19															20	21	22	O
170510011052	17	17	18	17	17	19	18	19	17	19															37	35	36	B
170510011053	18	18	17	18	18	18	16	19	16	17															25	28	27	A

SIGNATURE OF THE TEACHER

ROLL NO	Practical: NO OF CLASSES HELD	NO OF CLASSES ATTENDED	ATTENDANCE		EXPT 1	EXPT 2	EXPT 3	EXPT 4	EXPT 5	EXPT 6	EXPT 7	EXPT 8	EXPT 9	EXPT 10	EXPT 11	EXPT 12	EXPT 13	EXPT 14	EXPT 15	EXPT 16	EXPT 17	EXPT 18	EXPT 19	EXPT 20	EXPT 21	EXPT 22	EXPT 23	EXPT 24	SESSIONAL: 1ST SSS	2ND SSS	AVG	ESE GP
					B: CONTINUOUS ASSESSMENT (20)																											
170510011054	10	10	100	0	18	17	19	19	19	16	18	17	18	18															34	38	36	B
170510011055	10	10	100	0	19	18	19	17	19	17	18	16	17	19															38	39	39	A
170510011056	10	10	100	0	19	17	18	17	19	16	17	18	17	18															38	39	39	A
170510011058	10	10	100	0	19	18	17	17	18	18	19	18	19	16															39	40	40	B
170510011059	10	10	100	0	19	17	18	18	17	19	19	18	19	17															36	38	37	B
170510011060	10	10	100	0	17	19	17	19	18	17	19	18	17	18															39	39	39	B
170510011061	10	10	100	0	17	19	18	19	17	17	19	19	18	19															20	26	23	A
170510011062	10	10	100	0	17	18	17	19	18	17	18	19	19	19															35	37	36	B
170510011064	10	10	100	0	18	17	18	19	17	18	17	19	17	19															32	35	34	O
170510011065	10	10	100	0	19	18	19	18	19	19	18	19	17	19															33	32	33	O
170510011066	10	10	100	0	18	17	19	19	19	19	17	17	17	18															34	32	33	A
170510011068	10	10	100	0	19	18	19	17	19	19	19	18	18	17															35	36	35	A
170510011069	10	10	100	0	19	17	18	17	19	19	17	17	19	18															35	37	36	A
170510011070	10	10	100	0	19	18	17	17	18	17	18	18	19	17															35	35	35	O
170510011071	10	10	100	0	18	17	19	19	19	18	19	17	19	18															33	34	34	B
170510011072	10	10	100	0	19	18	19	17	19	16	19	18	19	17															24	25	25	C
170510011073	10	10	100	0	19	17	18	17	19	18	19	19	17	19															30	26	28	B
170510011074	10	10	100	0	19	18	17	17	18	19	19	18	17	19															34	32	33	A
170510011076	10	10	100	0	19	17	18	18	17	17	19	17	17	18															37	38	38	C
170510011077	10	10	100	0	17	19	17	19	18	17	19	18	18	17															28	30	29	A
170510011078	10	10	100	0	17	19	18	19	17	17	18	17	19	18															21	21	22	B
170510011079	10	10	100	0	17	18	17	19	18	18	17	18	19	17															24	24	24	A
170510011080	10	10	100	0	18	17	18	19	17	19	18	17	18	18															32	34	33	A
170510011081	10	10	100	0	19	18	19	18	19	19	17	18	19	17															23	22	23	A
170510011082	10	10	100	0	18	17	19	19	19	19	18	19	19	19															23	20	22	A
170510011083	10	10	100	0	19	18	19	17	19	19	17	19	17	18															34	32	33	
170510011084	10	10	100	0	19	17	18	17	19	18	17	16	17	18															20	22	21	A
170510011085	10	10	100	0	19	18	17	17	18	19	18	17	19	16															23	22	23	B
170510011086	10	10	100	0	19	17	18	17	19	19	17	17	19	17															38	39	39	B

Surendra Kushan
SIGNATURE OF THE TEACHER

ROLL NO				Practical												Practical																								SESSIONAL			ESE GP
																CONTINUOUS ASSESSMENT (30)																											
				NO OF CLASSES HELD	NO OF CLASSES ATTENDED	ATTENDANCE										EXPT 1	EXPT 2	EXPT 3	EXPT 4	EXPT 5	EXPT 6	EXPT 7	EXPT 8	EXPT 9	EXPT 10	EXPT 11	EXPT 12	EXPT 13	EXPT 14	EXPT 15	EXPT 16	EXPT 17	EXPT 18	EXPT 19	EXPT 20	EXPT 21	EXPT 22	EXPT 23	EXPT 24	1ST SES	2ND SES	AVG	
170510011087				10	10	100				0						18	17	19	19	19	18	17	18	19	17															24	22	23	A
170510011088				10	10	100				0						19	18	19	17	19	17	18	16	18	18															32	34	33	O
170510011089				10	10	100				0						19	17	18	17	19	17	18	16	18	18															39	39	39	A
170510011090				10	10	100				0						19	16	17	17	18	17	18	16	18	17															34	36	35	A
170510011091				10	10	100				0						19	17	18	18	17	17	18	16	18	19															23	27	25	A
170510011093				10	10	100				0						17	19	17	19	18	17	18	17	18	18															32	25	29	B
170510011094				10	10	100				0						17	19	18	19	17	17	18	16	18	18															20	21	21	A
170510011095				10	10	100				0						17	18	17	19	18	17	18	16	19	18															35	36	36	B
170510011096				10	10	100				0						18	17	18	19	17	17	18	16	18	18															21	20	21	B
170510011097				10	10	100				0						19	18	19	18	19	17	18	17	18	18															34	35	35	A
170510011098				10	10	100				0						18	17	19	19	19	17	19	18	19	19															21	20	21	C
170510011099				10	10	100				0						19	18	19	17	19	16	19	19	19	18															21	21	22	A
170510011100				10	10	100				0						19	17	18	17	19	18	19	17	19	17															27	28	28	O
170510011101				10	10	100				0						19	18	17	17	18	19	18	17	19	18															21	20	21	B
160510011078				10	10	100				0						19	17	18	18	17	17	17	17	18	17															21	21	21	A
180550011001				10	10	100				0						17	19	17	19	18	18	18	18	17	18															21	22	22	A
180550011002				10	10	100				0						17	19	18	19	17	16	17	19	18	17															24	27	26	B
180550011003				10	10	100				0						17	18	17	19	18	19	18	19	17	18															32	30	31	B
180550011004				10	10	100				0						18	17	18	19	17	17	17	19	18	19															31	28	30	B
180550011005				10	10	100				0						19	18	19	18	19	16	18	19	17	19															27	34	31	B
180550011006				10	10	100				0						18	17	18	19	17	16	18	19	17	19															29	30	30	B
180550011007				10	10	100				0						19	18	19	18	19	16	18	19	17	19															28	27	28	B
180550011010				10	10	100				0						19	18	17	17	18	19	18	17	19	18															30	31	31	B
										0																																0	
										0																																0	
										0																																0	
										0																																0	
										0																																0	
										0																																0	

SIGNATURE OF THE TEACHER

ROLL NO	Theory: NO. OF CLASSES HELD	Theory: NO. OF CLASSES ATTENDED	Theory: ATTENDANCE	Practical: NO. OF CLASSES HELD	Practical: NO. OF CLASSES ATTENDED	Practical: ATTENDANCE	Theory SESSIONAL (30): 1ST SES	2ND SES	3RD SES	AVG	CONTINUOUS EVALUATION (20): CE 1	CE 2	CE 3	AVG	ESE	Practical CONTINUOUS ASSESSMENT (20): EXPT 1	EXPT 2	EXPT 3	EXPT 4	EXPT 5	EXPT 6	EXPT 7	EXPT 8	EXPT 9	EXPT 10	EXPT 11	EXPT 12	EXPT 13	EXPT 14	EXPT 15	EXPT 16	EXPT 17	EXPT 18	EXPT 19	EXPT 20	EXPT 21	EXPT 22	EXPT 23	EXPT 24	SESSIONAL: 1ST SES	2ND SES	AVG	ESE GP
										0																																0	
										0																																0	
										0																																0	
										0																																0	
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										0																																0	
										0																																0	
										0																																0	

>80%

>70%

>60%

>50%

<50%

SIGNATURE OF THE TEACHER

ASSESSMENT REPORT

PROGRAM :	GIRIJANANDA CHOWDHURY INSTITUTE OF PHARMACEUTICAL SCIENCE				
UNIVERSITY :	Assam Science & Technology University				
NAME OF THE SUBJECT :	Theory:		Practical	Instrumental Method of Analysis	
SUBJECT CODE :	Theory:	0	Practical	BP705P	
SESSION :		Aug - December 2020			
NAME OF THE TEACHER(S) :		Mr.Susanker Kushari & Mr.Suman Kumar			

ASSESSMENT REPORT	ATTENDANCE	ATTENDANCE	SESSIONAL (30)				CONTINUOUS EVALUATION (20)				ESE	CONTINUOUS ASSESSMENT																							SESSIONAL			ESE
			1ST SES	2ND SES	3RD SES	AVG	CE 1	CE 2	CE 3	AVG		EXPT 1	EXPT 2	EXPT 3	EXPT 4	EXPT 5	EXPT 6	EXPT 7	EXPT 8	EXPT 9	EXPT 10	EXPT 11	EXPT 12	EXPT 13	EXPT 14	EXPT 15	EXPT 16	EXPT 17	EXPT 18	EXPT 19	EXPT 20	EXPT 21	EXPT 22	EXPT 23	EXPT 24	1ST SES	2ND SES	AVG	
NO. OF STUDENTS SCORED >= 80%	0	103	0	0	0	0	0	0	0	0	0	103	103	103	103	103	101	101	102	101	101	0	0	0	0	0	0	0	0	0	0	0	0	0	49	50	47	58
NO. OF STUDENTS SCORED >= 70%	0	102	0	0	0	0	0	0	0	0	0	103	103	103	103	103	103	103	103	103	103	0	0	0	0	0	0	0	0	0	0	0	0	0	62	66	63	92
NO. OF STUDENTS SCORED >= 60%	0	103	0	0	0	0	0	0	0	0	0	103	103	103	103	103	103	101	103	103	103	0	0	0	0	0	0	0	0	0	0	0	0	0	78	85	82	97
NO. OF STUDENTS SCORED >= 50%	0	103	0	0	0	0	0	0	0	0	0	103	103	103	103	103	103	103	103	103	103	0	0	0	0	0	0	0	0	0	0	0	0	0	103	103	103	97
NO. OF STUDENTS SCORED < 50%	0	0	0	0	0	132	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29	0

ASSESSMENT REPORT	ATTENDANCE	ATTENDANCE	SESSIONAL (30)				CONTINUOUS EVALUATION (20)				ESE	CONTINUOUS ASSESSMENT																										SESSIONAL			ESE
			1ST SES	2ND SES	3RD SES	AVG	CE 1	CE 2	CE 3	AVG		EXPT 1	EXPT 2	EXPT 3	EXPT 4	EXPT 5	EXPT 6	EXPT 7	EXPT 8	EXPT 9	EXPT 10	EXPT 11	EXPT 12	EXPT 13	EXPT 14	EXPT 15	EXPT 16	EXPT 17	EXPT 18	EXPT 19	EXPT 20	EXPT 21	EXPT 22	EXPT 23	EXPT 24	1ST SES	2ND SES	AVG	
% OF STUDENTS SCORED >= 80%	0	98	0	0	0	0	0	0	0	0	0	98	98	98	98	98	96	96	97	96	96	0	0	0	0	0	0	0	0	0	0	0	0	0	47	48	45	55
% OF STUDENTS SCORED >= 70%	0	97	0	0	0	0	0	0	0	0	0	98	98	98	98	98	98	98	98	98	98	0	0	0	0	0	0	0	0	0	0	0	0	0	59	63	60	88
% OF STUDENTS SCORED >= 60%	0	98	0	0	0	0	0	0	0	0	0	98	98	98	98	98	98	98	98	98	98	0	0	0	0	0	0	0	0	0	0	0	0	0	74	81	78	92
% OF STUDENTS SCORED >= 50%	0	98	0	0	0	0	0	0	0	0	0	98	98	98	98	98	98	98	98	98	98	0	0	0	0	0	0	0	0	0	0	0	0	0	98	98	98	92
% OF STUDENTS SCORED < 50%	0	0	0	0	0	126	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28	0
NO. OF STUDENTS APPEARED	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105
80% OF STUDENTS SCORED	>80%	>70%	>60%	<50%	<50%	>50%	<50%	<50%	<50%	>80%	>50%	<50%	<50%	<50%	<50%	<50%	<50%	<50%	<50%	<50%	<50%	<50%	<50%	<50%	<50%	<50%	<50%	<50%	<50%	<50%	<50%	<50%	<50%	<50%	<50%	<50%	<50%	<50%
	100	80	70	0	0	60	0	0	0	100	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

SIGNATURE OF THE TEACHER

WEIGHTAGE CONTRIBUTION TO RESPECTIVE COURSE OUTCOMES

Weightage	100	20					20	10			20	30																												
CO 1		0.2	0	0	0	0	0.2	0.1	0	0	0.2	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		20	0	0	0	0	12	0	0	0	20	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Weightage	100	20					20		10		30	20																												
CO 2		0.2	0	0	0	0	0	0	0.1	0	0.3	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		20	0	0	0	0	12	0	0	0	30	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Weightage	100	20		10			20			10	20	20																												
CO 3		0.2	0	0.1	0	0	0.2	0	0	0.1	0.2	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		20	0	7	0	0	12	0	0	0	20	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Weightage	100	20			10		20				20	30																												
CO 4		0.2	0	0	0.1	0	0.2	0	0	0	0.2	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		20	0	0	0	0	12	0	0	0	20	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Weightage	100	20		10			10	10			20	30																												
CO 5		0.2	0	0.1	0	0	0.1	0.1	0	0	0.2	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		20	0	7	0	0	6	0	0	0	20	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Weightage	100	30	20							20		30																												
CO 6		0.3	0.2	0	0	0	0	0	0	0.2	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		30	16	0	0	0	0	0	0	0	0	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

ATTAINMENT OF COURSE OUTCOMES

COs	% OF ATTAINMENT	ATTAIMENT LEVEL	REMARKS
CO 1	70	MODERATE	
CO 2	74	MODERATE	
CO 3	71	MODERATE	
CO 4	70	MODERATE	
CO 5	71	MODERATE	
CO 6	64	MODERATE	

Suvarna Kulkarni

SIGNATURE OF THE TEACHER