

YADAVA COLLEGE

(* An Autonomous Co-Educational Institution*

** Accredited with “A” Grade by NAAC**

Affiliated to Madurai Kamaraj University)

Govindarajan Campus, Thiruppalai, Madurai- 625014



DEPARTMENT OF CHEMISTRY

B.Sc., CHEMISTRY MAJOR

AND

CHEMISTRY ANCILLARY

REVISED CBCS SYLLABUS (2018 – 2021)

(Effective from the academic year 2018-2019 onwards)

**DEPARTMENT OF CHEMISTRY
YADAVA COLLEGE, MADURAI -14.
CBCS (2018-2021)**

COURSE CONTENT

SEMESTER - I

Sem	Part	Subject	Code	Title of the paper	Teach. Hours/ Week	Credits	Evaluation			Exam hours
							Int	Ext	Total	
I	I	Lang I		Paper I-Tamil	5	3	25	75	100	3
	II	Lang II		Paper I- English	5	3	25	75	100	3
	III	Core		Paper I- Fundamentals of Inorganic Chemistry	4	4	25	75	100	3
				Paper II- Fundamentals of Organic Chemistry	4	4	25	75	100	3
				Major practical I* - Semi micro qualitative Analysis	3	--	--	--	--	--
	Allied I		Paper I- Physics	3	2	25	75	100	3	
			Practical I*- Physics	2	--	--	--	--	--	
	IV	ENS		Environmental Science	2	2	25	75	100	3
		SBE		Communicative English-I	2	2	25	75	100	3
					Total	30	20	--	--	700

SEMESTER -II

Sem	Part	Subject	Code	Title of the paper	Teac. Hour/ Week	Credits	Evaluation			Exam hours
							Int	Ext	Total	
II	I	Lang I		Paper II-Tamil	5	3	25	75	100	3
	II	Lang II		Paper II- English	5	3	25	75	100	3
	III	Core		Paper III- Inorganic Chemistry	4	4	25	75	100	3
				Paper IV- Organic and Physical Chemistry	4	4	25	75	100	3
				Major practical I* - Semi micro qualitative Analysis	3	4	40	60	100	3
	Allied I			Paper II- Physics	3	2	25	75	100	3
				Practical I*- Physics	2	1	40	60	100	3
	IV	VAE		Value Education	2	2	25	75	100	3
		SBE		Communicative English-II	2	2	25	75	100	3
	V	NSS/ NCC/ PET/ EXT			---	1	---	---	---	---
				Total	30	26	--	--	900	--

SEMESTER -III

Sem	Part	Subject	Code	Title of the paper	Teac. Hours/Week	Credits	Evaluation			Exam hours	
							Int	Ext	Total		
III	I	Lang I		Paper III-Tamil	5	3	25	75	100	3	
	II	Lang II		Paper III- English	5	3	25	75	100	3	
	III	Core		Paper V- General Chemistry - I	4	4	25	75	100	3	
				Major practical II* - Volumetric Analysis	2	--	--	--	--	--	
		Allied I		Paper III- Physics	3	2	25	75	100	3	
				Practical II*- Physics	2	--	--	--	--	--	
	Allied II		Paper I - Maths/ Botany	3(B)/5 (M)	2(B)/ 2(M)	25	75	100	3		
			Practical I*- Botany	2	--	--	--	--	--		
	IV	NME		Dairy Science	2	2	25	75	100	3	
		SBE		Communicative English -III	2	2	25	75	100	3	
					Total	30	18	--	--	700	--
	Self Study -I				Food Chemistry	--	3 (extra credit)	25	75	100	3

SEMESTER IV

Sem	Part	Subject	Code	Title of the paper	Teac. Hour/Week	Credits	Evaluation			Exam hours	
							Int	Ext	Total		
IV	I	Lang I		Paper IV-Tamil	5	3	25	75	100	3	
	II	Lang II		Paper IV- English	5	3	25	75	100	3	
	III	Core		Paper VI- General Chemistry - II	4	4	25	75	100	3	
				Major practical II* - Volumetric Analysis	2	3	40	60	100	3	
		Allied I		Paper IV- Physics	3	2	25	75	100	3	
				Practical II*- Physics	2	1	40	60	100	3	
	Allied II		Paper II Maths/ Botany	3(B)/ 5(M)	2(B)/ 3(M)	25	75	100	3		
			Practical I*- Botany	2	1	40	60	100	3		
	IV	NME		Small Scale Industrial Chemicals	2	2	25	75	100	3	
		SBE		Communicative English - IV	2	2	25	75	100	3	
					Total	30	23	--	--	900 (M) / 1000 (B)	--
	Self Study-II				Forensic Chemistry	--	3 (extra credit)	25	75	100	3

SEMESTER V

Sem	Part	Subject	Code	Title of the Paper	Teach. Hours/Weak	Credit	Evaluation			Exam hours	
							Int	Ext	Total		
V	III	Core		Paper VII - Physical Chemistry -I	5	5	25	75	100	3	
		Major Elective-I		Paper I - Organic Chemistry -I	5	5	25	75	100	3	
		Major Elective-II		Paper II - Applied Chemistry	5	5	25	75	100	3	
				Major Practical III – Gravimetric Estimation and Organic Preparation	5	5	40	60	100	6	
				Practical IV* – Organic Analysis, & Estimation	3	--	--	--	--	--	
		Allied II		Paper III-Maths /Botany	5(M)/3(B)	2(B)/2(M)	25	75	100	3	
			Practical II*- Botany	2	--	--	--	--	3		
	IV	SBE		Soft skills	2	2	25	75	100	3	
					Total	30	24	--	--	600 (B) / (M)	--
	Self Study-III				Non Conventional and Renewable Sources of Energy	--	3 (extra credit)	25	75	100	3

SEMESTER VI

Sem	Part	Subject	Code	Title of the Paper	Teach. Hours/Week	Credit	Evaluation			Exam hours	
							Int	Ext	Total		
VI	III	Core		Paper VIII- Organic Chemistry -II	3	3	25	75	100	3	
				Paper IX - Physical Chemistry -II	4	4	25	75	100	3	
				Paper X- Computer in Chemistry	3	3	25	75	100	3	
		Major Elective III		Paper III-Green and Nano Chemistry	5	5	25	75	100	3	
				Major Practical IV* – Organic Analysis, & Estimation	3	4	40	60	100	6	
				Major Practical V – Physical Chemistry	5	5	40	60	100	6	
		Allied II		Paper IV-Maths /Botany	5(M)/3(B)	2(B)/3(M)	25	75	100	3	
				Practical II*- Botany	2	1	40	60	100	3	
	IV	SBE		General Knowledge	2	2	25	75	100	3	
					Total	30	29	--	--	900(B) / 800(M)	--
	Self Study-IV				Medicinal Chemistry	--	3 (extra credit)	25	75	100	3

*Exams Conducted at the end of even semester

DEPARTMENT OF CHEMISTRY

YADAVA COLLEGE, MADURAI-14
CBCS (2018-2021)

COURSE CONTENT
B.Sc., Chemistry Major with Mathematics Ancillary

SEMESTER -I

Sem	Part	Subject	Code	Title of the paper	Teach. Hours/ Week	Credits	Evaluation			Exam hours
							Int	Ext	Total	
I	I	Lang I		Paper I-Tamil	5	3	25	75	100	3
	II	Lang II		Paper I- English	5	3	25	75	100	3
	III	Core		Paper I- Fundamentals of Inorganic Chemistry - I	4	4	25	75	100	3
				Paper II- Fundamentals of Organic Chemistry	4	4	25	75	100	3
				Major practical I* - Semi micro qualitative Analysis	3	--	--	--	--	--
	Allied I		Paper I- Physics	3	2	25	75	100	3	
			Practical I*- Physics	2	--	--	--	--	--	
	IV	ENS		Environmental Science	2	2	25	75	100	3
		SBE		Communicative English-I	2	2	25	75	100	3
					Total	30	20	--	--	700

SEMESTER -II

Sem	Part	Subject	Code	Title of the paper	Teac. Hour/ Week	Credits	Evaluation			Exam hours
							Int	Ext	Total	
II	I	Lang I		Paper II-Tamil	5	3	25	75	100	3
	II	Lang II		Paper II- English	5	3	25	75	100	3
	III	Core		Paper III- Inorganic Chemistry	4	4	25	75	100	3
				Paper IV- Organic and Physical Chemistry	4	4	25	75	100	3
				Major practical I* - Semi micro qualitative Analysis	3	4	40	60	100	3
	Allied I		Paper II- Physics	3	2	25	75	100	3	
			Practical I*- Physics	2	1	40	60	100	3	
	IV	VAE		Value Education	2	2	25	75	100	3
		SBE		Communicative English-II	2	2	25	75	100	3
	V	NSS/ NCC/ PET/ EXT			---	1	---	---	---	---
				Total	30	26	--	--	900	--

SEMESTER -III

Sem	Part	Subject	Code	Title of the paper	Teac. Hour/Week	Credits	Evaluation			Exam hours	
							Int	Ext	Total		
Sem	Part	Subjec	Code	Title of the paper	Week	Credits	Evaluation			hours	
III	I	Lang I		Paper III-Tamil	5	3	25	75	100	3	
	II	Lang II		Paper III- English	5	3	25	75	100	3	
	III	Core		Paper V- General Chemistry - I	4	4	25	75	100	3	
				Major practical II* - Volumetric Analysis	2	--	--	--	--	--	
		Allied I		Paper III- Physics	3	2	25	75	100	3	
				Practical II*- Physics	2	--	--	--	--	--	
	Allied II		Paper I-Maths	5	2	25	75	100	3		
	IV	NME		Dairy Science	2	2	25	75	100	3	
		SBE		Communicative English -III	2	2	25	75	100	3	
					Total	30	18	--	--	700	--
	Self Study-I				Food Chemistry	--	3 (extra credit)	25	75	100	3

SEMESTER IV

							Int	Ext	Total		
IV	I	Lang I		Paper IV-Tamil	5	3	25	75	100	3	
	II	Lang II		Paper IV- English	5	3	25	75	100	3	
	III	Core		Paper VI- General Chemistry - II	4	4	25	75	100	3	
				Major practical II* - Volumetric Analysis	2	3	40	60	100	3	
		Allied I		Paper IV- Physics	3	2	25	75	100	3	
				Practical II*- Physics	2	1	40	60	100	3	
		Allied II		Paper II- Maths	5	3	25	75	100	3	
	IV	NME		Small Scale Industrial Chemicals	2	2	25	75	100	3	
		SBE		Communicative English -IV	2	2	25	75	100	3	
					Total	30	23	--	--	900	--
	Self Study-II				Forensic Chemistry	--	3 (extra credit)	25	75	100	3

SEMESTER V

Sem	Part	Subject	Code	Title of the Paper	Teach. Hours/	Credits	Evaluation			Exam hours
							Int	Ext	Total	

					Weak						
V	III	Core		Paper VII- Physical Chemistry -I	5	5	25	75	100	3	
		Major Elective - I		Paper I- Organic Chemistry -I	5	5	25	75	100	3	
		Major Elective - II		Paper II-Applied Chemistry	5	5	25	75	100	3	
				Major Practical III – Gravimetric Estimation and Organic Preparation	5	5	40	60	100	6	
				Major Practical IV* – Organic Analysis, & Estimation	3	--	--	--	--	--	
		Allied II		Paper III-Maths	5	2	25	75	100	3	
	IV	SBE		Soft skills	2	2	25	75	100	3	
					Total	30	24	--	--	600	--
	Self Study-III				Non Conventional and Renewable Sources of Energy	--	3 (extra credit)	25	75	100	3

SEMESTER VI

Sem	Part	Subject	Code	Title of the Paper	Teach. Hours/	Credits	Evaluation			Exam hours
							Int	Ext	Total	

				Weak						
VI	III	Core		Paper VIII- Organic Chemistry -II	3	3	25	75	100	3
				Paper IX- Physical Chemistry -II	4	4	25	75	100	3
				Paper X- Computer in Chemistry	3	3	25	75	100	3
		Major Elective III		Paper III-Green and Nano Chemistry	5	5	25	75	100	3
				Major Practical IV* – Organic Analysis, & Estimation	3	4	40	60	100	6
				Major Practical V – Physical Chemistry	5	5	40	60	100	6
		Allied II		Paper IV-Maths	5	3	25	75	100	3
	IV	SBE		General Knowledge	2	2	25	75	100	3
				Total	30	29	--	--	800	--
	Self Study-IV			Medicinal Chemistry	--	3 (extra credit)	25	75	100	3

*Exams Conducted at the end of even semester

**DEPARTMENT OF CHEMISTRY
YADAVA COLLEGE, MADURAI-14
CBCS (2018-2021)
COURSE CONTENT**

B.Sc., Chemistry Major with Botany Ancillary

SEMESTER -I

Sem	Part	Subject	Code	Title of the paper	Teach. Hours/Week	Credits	Evaluation			Exam hours
							Int	Ext	Total	
I	I	Lang I		Paper I-Tamil	5	3	25	75	100	3
	II	Lang II		Paper I- English	5	3	25	75	100	3
	III	Core		Paper I- Fundamentals of Inorganic Chemistry	4	4	25	75	100	3
				Paper II- Fundamentals of Organic Chemistry	4	4	25	75	100	3
				Major practical I* - Semi micro qualitative Analysis	3	--	--	--	--	--
	Allied I		Paper I- Physics	3	2	25	75	100	3	
			Practical I*- Physics	2	--	--	--	--	--	
	IV	ENS		Environmental Science	2	2	25	75	100	3
		SBE		Communicative English-I	2	2	25	75	100	3
					Total	30	20	--	--	700

SEMESTER -II

Sem	Part	Subject	Code	Title of the paper	Teac.	Credits	Evaluation		
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Sem	Part	Subject	Code	Title of the paper	Teac. Hour/Week	Credits	Evaluation			Exam hours
							Int	Ext	Total	
II	I	Lang I		Paper II-Tamil	5	3	25	75	100	3
	II	Lang II		Paper II- English	5	3	25	75	100	3
	III	Core		Paper III- Inorganic Chemistry	4	4	25	75	100	3
				Paper IV- Organic and Physical Chemistry	4	4	25	75	100	3
				Major practical I* - Semi micro qualitative Analysis	3	4	40	60	100	3
	Allied I			Paper II- Physics	3	2	25	75	100	3
				Practical I*- Physics	2	1	40	60	100	3
	IV	VAE		Value Education	2	2	25	75	100	3
		SBE		Communicative English-II	2	2	25	75	100	3
	V	NSS/ NCC/ PET/ EXT			---	1	---	---	---	---
				Total	30	26	--	--	900	--

SEMESTER - III

							Int	Ext	Total	
	I	Lang I		Paper III-Tamil	5	3	25	75	100	3
Sem	II Part	Lang II Subject	Code	Paper III- English Title of the paper	Teac. Hour/ Week	Credits	Evaluation			Exam hours
							Int	Ext	Total	
III	III	Core		Paper V- General Chemistry - I	4	4	25	75	100	3
				Major practical II* - Volumetric Analysis	2	--	--	--	--	--
		Allied I		Paper III- Physics	3	2	25	75	100	3
				Practical II*- Physics	2	--	--	--	--	--
		Allied II		Paper I- Botany	3	2	25	75	100	3
				Practical I*- Botany	2	--	--	--	--	--
	IV	NME		Dairy Science	2	2	25	75	100	3
		SBE		Communicative English -III	2	2	25	75	100	3
				Total	30	18	--	--	700	--
	Self Study-I			Food Chemistry	--	3 (extra credit)	25	75	100	3

SEMESTER IV

IV	I	Lang I		Paper IV-Tamil	5	3	25	75	100	3	
	II	Lang II		Paper IV- English	5	3	25	75	100	3	
	III	Core		Paper VI- General Chemistry - II	4	4	25	75	100	3	
				Major practical II* - Volumetric Analysis	2	3	40	60	100	3	
		Allied I		Paper IV- Physics	3	2	25	75	100	3	
				Practical II*- Physics	2	1	40	60	100	3	
	Allied II		Paper II- Botany	3	2	25	75	100	3		
			Practical I*- Botany	2	1	40	60	100	3		
	IV	NME		Small Scale Industrial Chemicals	2	2	25	75	100	3	
		SBE		Communicative English -IV	2	2	25	75	100	3	
					Total	30	23	--	--	1000	--
	Self Study-II				Forensic Chemistry	--	3 (extra credit)	25	75	100	3

SEMESTER V

Sem	Part	Subject	Code	Title of the Paper	Teach. Hours/	Credits	Evaluation			Exam hours
							Int	Ext	Total	

				Weak							
V	III	Core		Paper VII- Physical Chemistry -I	5	5	25	75	100	3	
		Major Elective - I		Paper I- Organic Chemistry -I	5	5	25	75	100	3	
		Major Elective- II		Paper II-Applied Chemistry	5	5	25	75	100	3	
				Major Practical III – Gravimetric Estimation and Organic Preparation	5	5	40	60	100	6	
				Major Practical IV* – Organic Analysis, & Estimation	3	--	--	--	--	--	
		Allied II		Paper III-Botany	3	2	25	75	100	3	
			Practical II*- Botany	2	--	--	--	100	3		
	IV	SBE		Soft skills	2	2	25	75	100	3	
					Total	30	24	--	--	700	--
	Self Study-III				Non Conventional and Renewable Sources of Energy	--	3 (extra credit)	25	75	100	3

SEMESTER VI

Sem	Part	Subject	Code	Title of the Paper	Teach. Hours/ Week	Credits	Evaluation			Exam hours
							Int	Ext	Total	

VI	III	Core		Paper VIII- Organic Chemistry -II	3	3	25	75	100	3
				Paper IX - Physical Chemistry -II	4	4	25	75	100	3
				Paper X- Computer in Chemistry	3	3	25	75	100	3
		Major Elective III		Paper III-Green and Nano Chemistry	5	5	25	75	100	3
				Major Practical IV* – Organic Analysis, & Estimation	3	4	40	60	100	6
				Major Practical V – Physical Chemistry	5	5	40	60	100	6
		Allied II		Paper IV-Botany	3	2	25	75	100	3
				Practical II*- Botany	2	1	40	60	100	3
	IV	SBE		General Knowledge	2	2	25	75	100	3
				Total	30	29	--	--	900	--
Self Study-IV			Medicinal Chemistry	--	3 (extra credit)	25	75	100	3	

*Exams Conducted at the end of even semester

DEPARTMENT OF CHEMISTRY
YADAVA COLLEGE, MADURAI -14.
CBCS (2018-2021)

COURSE CONTENT

Chemistry Ancillary for Physics and Zoology Major

SEMESTER I TO IV

Sem	Part	Subject	Code	Title of the paper	Teach. Hours/ Week	Credits	Evaluation			Exam hours
							Int	Ext	Total	
I	III	Anc -I		Paper I- General Chemistry -I	3	2	25	75	100	3
		Pra -I*		Qualitative Analysis	2	--	--	--	--	--
II	III	Anc -II		Paper II- General Chemistry -II	3	2	25	75	100	3
		Pra -I*		Qualitative Analysis	2	1	40	60	100	3
III	III	Anc -III		Paper III- General Chemistry -III	3	2	25	75	100	3
		Pra -II*		Volumetric Analysis	2	--	--	--	--	--
IV	III	Anc -IV		Paper IV- General Chemistry -IV	3	2	25	75	100	3
		Pra -II*		Volumetric Analysis	2	1	40	60	100	3
		Total			20	10	--	--	600	--

Anc – Ancillary Chemistry

Pra - Practical

*Exams conducted at the end of the semester

**DEPARTMENT OF CHEMISTRY
YADAVA COLLEGE, MADURAI-14
CBCS (2018-2021)
COURSE CONTENT**

B.Sc., Chemistry Major with Ancillary Physics, Maths/Botany

Sem	Part	Subject	Code	Title of the Paper	Teach.	Credits	Evaluation	Exam
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					Hours/ Week		Int	Ext	Total	hours
I	III	Allied I		Paper I – Physics	3	2	25	75	100	3
				Practical I* – Physics	2	--	--	--	--	--
II	III	Allied I		Paper II – Physics	3	2	25	75	100	3
				Practical I* – Physics	2	1	40	60	100	3
III	III	Allied I		Paper III – Physics	3	2	25	75	100	3
				Practical II* – Physics	2	--	--	--	--	--
		Allied II		Paper I – Botany/ Maths	3(B)/ 5 (M)	2	25	75	100	3
				Practical I* – Botany	2	--	--	--	--	--
IV	III	Allied I		Paper IV – Physics	3	2	25	75	100	3
				Practical II* – Physics	2	1	40	60	100	3
		Allied II		Paper II – Botany/Maths	3(B)/ 5 (M)	2(B)/ 3(M)	25	75	100	3
				Practical I* – Botany/Maths	2	1	40	60	100	3
V	III	Allied II		Paper III – Botany/Maths	3(B)/ 5 (M)	2	25	75	100	3
				Practical II* – Botany	2	--	--	--	--	--
VI	III	Allied II		Paper IV – Botany/Maths	3(B)/ 5 (M)	2(B)/ 3(M)	25	75	100	3
				Practical II* – Botany	2	1	40	60	100	3

*Exams Conducted at the end of even semester

CONSOLIDATED DISTRIBUTION OF NUMBER OF PAPERS, HOURS OF TEACHING AND CREDITS

Part	Subject	Number of papers		Total no.of papers	Total no.of hours	Credits
		Theory	Practical			
Part I	Tamil	4	--	4	20	12
Part II	English	4	--	4	20	12
Part III	Core	10	5	15	65	60
	Major Elective	3	--	3	15	15
	Allied –I	4	2	6	20	10

	Allied –II	4(M/B)	2(B)	4(M)6(B)	20	10
Part IV	SBE	6	--	6	12	12
	VAE	1	--	1	02	2
	NME	2	--	2	04	4
	ENS	1	--	1	02	2
Part V	NSS/NCC/PE/EXT	--	--	--		1
Grand Total		39	9	46(M)* 48(B)*	180	140

Self Study Paper Extra credit - 12

*M- Maths

*B- Botany

DEPARTMENT OF CHEMISTRY

Yadava College, Madurai -14

Self study paper for brilliant students to earn extra credits
Under graduate course (B.Sc)

S.NO	Sem	Sub code	Subject	Credit	Evaluation	Total
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					Duration Hours	Int.	Ext.	Marks
1	III		Food Chemistry	3	--	25	75	100
2	IV		Forensic Chemistry	3	--	25	75	100
3	V		Non conventional & Renewable sources of energy	3	--	25	75	100
4	VI		Medicinal Chemistry	3	--	25	75	100

DEPARTMENT OF CHEMISTRY

Yadava College, Madurai -14

Certificate course – Analytical Chemistry

Under graduate course (B.Sc)

S.NO	Sem	Sub code	Subject	Credit	Evaluation			Total Marks
					Duration Hours	Int.	Ext.	
1	VI		Paper – I: Instrumental Methods of Chemical Analysis	--	45	25	75	100
2	VI		Paper – II: Clinical Chemical Analysis	--	45	25	75	100

DEPARTMENT OF CHEMISTRY
 YADAVA COLLEGE
 MADURAI -14
 QUESTION PAPER PATTERN
 Undergraduate courses

(Both Major and Allied Papers)

Time: 3 hrs

Maximum marks: 75

SECTION- A

(10 X 2 = 20)

Answer any TEN questions only

TEN questions to be answered out of *fifteen* questions

(THREE questions from each unit)

SECTION- B

(5 X 5 = 25)

Answer all FIVE questions

FIVE questions (either or) One question from each unit.

SECTION- C

(3 X 10 = 30)

Answer any THREE questions only

THREE questions to be answered out of *five* questions

(One question from each Unit)

The serial number of the questions has to be continuous from 1 to 25 from Section A to Section C.

PAPER- I

FUNDAMENTALS OF INORGANIC CHEMISTRY

Semester : I

Subject code :

Hours/week : 4

Total Hours/Semester : 60

Credit : 4

Objectives :

This course covers the basic and detailed aspects of atomic structure, periodic classification, chemical bonding, basic knowledge of Laboratory hygiene and safety.

Unit-I: Atomic Structure (12 hours)

Brief introduction of history of structure of atom – Thomson’s model of atom - Rutherford’s nuclear model of an atom - Defects of Rutherford’s model - Postulates of Bohr’s model of an atom - limitations of Bohr’s theory - Electronic configuration and quantum numbers-orbitals- Shapes of s, p and d orbitals - Pauli’s exclusion principle – uses of Pauli’s exclusion principle - Hund’s rule of maximum multiplicity-Aufbau principle-Stability of orbitals.

Unit-II: Periodic Classification (12 hours)

- i) Brief history of periodic classification – Dobereiner’s Triads - Newlands Law of octaves. Lother mayers arrangement – Mendeleev’s periodic table, modern periodic law, long form of the periodic table - structural features of the long form of the periodic table.
- ii) **Electronic configuration and periodic table:**
 - a) Electronic configuration in periods
 - b) Electronic configuration in groups
- iii) **Types of Elements:** s,p,d,f blocks
- iv) **Periodicity of Property:**

Atomic and ionic radii, Ionization energy, Electron affinity, Electronegativity
- v) Anomalous periodic properties in terms of screening constant, stability.

Unit-III: Chemical Bonding -I (12 hours)

- a) **Types of bonds:**
 - i) Ionic bond – definition with examples.
 - ii) Covalent bond – definition with examples - Fajan’s rule.
 - iii) Differences between ionic and covalent bonds
 - iv) Co-ordinate covalent bond – definition with examples.
 - v) Hydrogen bond – definition with examples and its types.
 - vi) Metallic bond – definition with examples.
- b) **Some important bond characteristics:** bond length, bond angle and bond energy.

Unit-IV: Chemical Bonding-II (12 Hours)

i) Valence bond theory: Postulates of valence bond theory- types of overlapping viz s-s, s-p and p-p overlapping –sigma and pi-bonds- differences between sigma and pi-bonds.

ii) Molecular orbital theory: Linear combination of atomic orbital-bonding and antibonding molecular orbitals. MO diagram of simple homonuclear molecules like H₂, He₂, O₂, F₂ and heteronuclear molecules like CO and NO. Comparison between VBT and MOT.

iii) VSEPR Theory: A detailed study of VSEPR theory and its applications.

iv) Hybridization: Definition - conditions of hybridization- types of hybridization with an example.

Unit-V: Semi micro Qualitative Analysis (12 hours)

a) Laboratory hygiene and safety:

Storage and handling of chemicals – carcinogenic chemicals – Toxic and poisonous chemicals – Waste disposal – Fume disposal – General precautions for avoiding accidents – First aid techniques – Hazards in laboratory - poisoning – methods to avoid poisoning – Treatment for specific poison – laboratory safety measures.

b) Principles and techniques of semi micro methods:

Aims of semi micro qualitative analysis – Types of reactions involved in qualitative analysis – Dry reactions – precipitation reactions – Applications of solubility product principle in qualitative analysis – Complexation reaction – Oxidation and reduction reactions – Spot tests – preparation of solution for cation testing on semi micro scale – Removal of interfering ions in the analysis of cations – oxalate, tartrate, borate, fluoride, chromate, phosphate and arsenite.

Text books:

1. P.L. Soni, “Text Book of Inorganic Chemistry”, Sultan Chand & Co, New Delhi; 2004.

[U – I- 41-82, U-II&IV – 205-261]

2. P.R.Puri, L.R. Sharma, K.C . Kalia, “Principles of Inorganic Chemistry”, Vishal

Publications, Jalandhar, 2001. [U-II- 1-58]

3. Satya prakash, G.D Tuli, S.K.Basu, R.D Madan “Advanced Inorganic Chemistry”,

- S.Chand & Co, New Delhi- 2008. [U-II: 1-10, U-III: 102-147]
4. Wahid U.Malik, G.D Tuli, R.D Madan “Selected topics in Inorganic Chemistry”, S.Chand & Co, New Delhi- 2002. [U-IV – 92-142]
5. R.D.Madan, “ Modern Inorganic Chemistry”, S.Chand & Co, New Delhi, 2004. [U – IV: 92- 142]
6. R. Gopalan, P.S. Subramanian, K. Rengarajan, “Elements of Analytical Chemistry”, S. Chand & Sons New Delhi, 2005. [U-V: 1-10,82-97]

Reference books:

1. J. D. Lee, “Concise Inorganic Chemistry:, Fifth Edition, Blackwell Science, USA, 2003. [U-II: 1-10]
2. J. D. Lee, “Concise Inorganic Chemistry:, Second Edition, Blackwell Science, USA, 1964.

PAPER-II

FUNDAMENTALS OF ORGANIC CHEMISTRY

Semester : I
Hours/week : 4
Credit : 4

Subject code:
Total Hours/Semester: 60

Objectives:

This course covers the basic and detailed aspects of fundamental concept of organic chemistry like nomenclature of organic compounds, purification techniques, composition of organic compounds, reaction mechanisms and applications of mechanistic concepts and types of organic reactions.

Unit –I: Introduction to Organic chemistry (12 hours)

- i) Organic chemistry- Introduction – characteristics of organic compounds – differences between organic and inorganic compounds-sources and importance of organic compounds - classification of organic compounds – functional groups - homologous series.
- ii) Nomenclature of organic compounds: Common name and IUPAC names of alkanes, Alkenes, alkynes, alkyl halides, alcohols, ether, aldehyde, ketone, carboxylic acids, derivatives of carboxylic acids, amines and nitro compounds.
- iii) IUPAC rules for naming multifunction compounds.

Unit -II: Purification of Organic Compounds (12 hours)

- i) Crystallization and Sublimation
- ii) Distillation – Fractional distillation – distillation under reduced pressure – Steam Distillation
- iii) Extraction with a solvent: soxhlet extraction
- iv) Chromatography: Column chromatography, Gas-liquid chromatography
- v) Tests of Purity: Melting point – determination of melting point, mixed melting point – Boiling point – determination of boiling point (distillation method, capillary tube method).

Unit – III: Composition of Organic compounds (12 hours)

- i) **Detection of Elements:** Detection of carbon, hydrogen and nitrogen (Lassaigne's test)
- ii) **Estimation of Elements:** Estimation of carbon, hydrogen, nitrogen (Kjeldahl method) and halogens (Carius method).

iii) Empirical and Molecular formula: Empirical formula – calculation of empirical formula, Molecular formula – calculation of molecular formula.

Unit – IV: Reaction mechanism – Fundamentals Aspects (12 hours)

i) Introduction – (electron displacement effect – inductive effect – mesomeric effect – electromeric effect and hyperconjugative effect). Distinction between electromeric effect and inductive effect.

ii) Bond fission: Homolytic bond fission and heterolytic bond fission.

iii) Reaction intermediates: formation, stability and structure of carbonium ion, carbanion and free radicals.

iv) Attacking reagents and their role: Electrophilic and nucleophilic reagents.

Unit -V: Application of Mechanic concepts (12 hours)

a) Mechanisms:

(i) Substitution reaction: Mechanism of SN^1 and SN^2 reactions.

(ii) Elimination reaction: Mechanism of E_1 and E_2 reactions.

(iii) Addition reaction: Mechanism of electrophilic and nucleophilic addition reactions.

b) Types of Organic reaction:

(i) Rearrangement reaction: Definition - intra and inter molecular rearrangement reaction with an example.

(ii) Polymerization reaction: Definition - addition and condensation polymerisation reaction with an example.

(iii) Reduction reaction: Definition - Clemmensen and Wolff-Kishner reduction, Meerwein-Ponndorf-Vrley reduction.

(iv) Oxidation reaction: Definition - Oppenauer oxidation reaction, Oxidation number – rules for calculating oxidation number.

(v) Redox reaction: Definition - Oxidation numbers involved in redox reactions.

Text Books:

1. B.S.Bahl & Arun Bahl, “Advanced Organic Chemistry”, S.Chand & Co. New Delhi-2008. [Unit I: 1-5, 146-183, Unit II: 6-17, Unit –III: 18-36, Unit –IV: 80-95, Unit – V: 99-114]

2. P.L.Soni, H.M.Chawla, “Text Book of Organic Chemistry”, Sultan Chand & Sons.

New Delhi-1990. [Unit I: 1.108-1.133, Unit II: 1.16-1.25, Unit –III: 1.26-1.41 & 1.49-1.55,
Unit –IV: 1.138-1.148, Unit – V: 1.148-1.156]

3. Bhupinder Mehta & Mnju Mehta, “Organic Chemistry”, PHI Learning PVT, New Delhi-2008. [Unit I: 1-4, Unit II: 22-25, Unit –IV: 80-95, Unit – V: 130-132]
4. R.L. Madan, “Simplified Course in Organic Chemistry”, S.Chand & Co. New Delhi-2001. [Unit IV: 69- 80]

Reference Books:

1. K.S.Tewari, S.N.Mehrotra, N.K.Vishnoi, “A Text Book of Organic Chemistry” Vikas Publishing House Pvt Ltd, New Delhi-1987
2. I.L.Finar, “Organic Chemistry”, Vol-I, Pearson Education-2003.

MAJOR PRACTICAL-I

Course : I - B.Sc

Semester : I & II

Practical : I

Title of the Paper: Semi micro Qualitative Analysis

Subject code:

No of hours/ week: 3

No of Credits: 4

(At the end of the **FIRST YEAR**)

Course Objectives:

To make the students analyze a mixture containing two cations (basic radicals) and two anions (acid radicals) of which one is an interfering ion by semi- micro method.

Cations (Basic radicals): Lead, Copper, Iron, Aluminium, Nickel, Manganese, Zinc, Barium, Strontium, Calcium, Magnesium and Ammonium.

Anions (Acid radicals):

Simple: Carbonate, Nitrate, Sulphate, Chloride and Sulphide.

Interfering: Borate, Phosphate, Fluoride, Chromate and Oxalate.

Total Marks = 100 (Internal 40 + External 60)

Internal Marks Distribution:

Acid radical	= 15
Basic radical	= 15
Confirmatory test	= 05
Procedure	= 05

Total	= 40

External Marks Distribution:

Record	= 10
Acid radical	= 15
Basic radical	= 15
Confirmatory test	= 10 (5+5)
Procedure	= 10 (5+5)

Total	= 60

**ANCILLARY CHEMISTRY
PAPER I
GENERAL CHEMISTRY - I**

Semester : I

Sub code:

Hours/ week:3

Total hours/ Semester: 45

Credit : 2

Objectives :

To enable the students to understand the fundamental concepts in

- Nature of bonding and reaction mechanism in organic chemistry
- Isomerism in organic compounds
- Principles and process of metallurgy
- Modern field of radioactivity
- Problems in oxidation and reduction.

Unit- I: Fundamental Concepts of Organic Chemistry (9 hours)

i) Types of Reaction: Substitution reaction (SN^1 & SN^2)- electrophilic and nucleophilic addition reactions- elimination reaction (E_1 & E_2)- addition and condensation polymerization reactions with suitable examples.

ii) Homolytic and heterolytic cleavage of carbon-carbon bond: carbonium ion and carbanion –free radicals; nucleophilic and electrophilic reagents.

Unit-II: Isomerism in Organic Compounds (9 hours)

i) Isomerism: Definition - types and examples of structural and stereo isomerisms.

ii) Optical isomerism: Optical activity-definition-condition for optical activity-isomerism of lactic and tartaric acids-racemization-resolution of racemic mixtures, Walden inversion, asymmetric synthesis.

Unit-III: Principles and Process of Metallurgy (9 hours)

i) Ores and minerals: Definition-examples -various steps of metallurgy-crushing, pulverizing concentration of the ore- calcination and roasting- reduction into metals Alumino-thermic process

ii) Refining of metals: Electrolytic refining, Zone refining and Van-Arkel process

Unit-IV: Radioactivity (9 hours)

i) Comparison of properties of α, β, γ rays-detection & measurements of radioactivity- GM counter –bubble chamber- cloud chamber.

ii) Fajan's –Russel-Soddy's group displacement law –illustration- law of radioactivity disintegration constant –average life; half-life period-radioactive series.

Unit- V: Oxidation and Reduction

(9 hours)

Electronic concept of oxidation and reduction –oxidation number-definition of oxidation and reduction in terms of oxidation number-calculation of oxidation numbers of Cr, Mn, Fe, Cu, & halogens-problems –oxidizing and reducing agents- redox reactions- oxidation numbers involved in redox reactions.

Text Books:

1. B.S. Bahl & Arun Bahl, “Advanced Organic Chemistry”, S. Chand & Co, Ramnagar, New Delhi, 2004
2. P.L. Soni, H.M. Chawla, “Text Book of Organic Chemistry”, Sultan & Sons, New Delhi, 2004
3. B.R.Puri, L.R.Sharma, Madan S.Pathania, “Principles of Physical Chemistry”, Shoban Lal Nagin Chand & Co, Jalandhar, 1998.

Reference Books:

1. Wahid U.Malik and G.D.Tuli,R.D.Madan, “Selected Topics in Inorganic Chemistry”, S. Chand & Co., New Delhi in 2002.

ANCILLARY PRACTICAL-I

Course : I - B.Sc Phy & Zoo

Subject code:

Semester : I & II

No of hours/ week: 2

Practical : I

No of Credits: 1

Title of the Paper: Qualitative Analysis

(At the end of the **FIRST YEAR**)

Course Objectives:

To make the students analyze a simple salt containing one cation (basic radical) and one anion (acid radical) by macro method.

Analysis of a simple salt (By macro method)

Cations: Lead, copper, iron, aluminium, zinc, manganese, nickel, calcium, barium, strontium, magnesium and ammonium.

Anions: Carbonate, chloride, fluoride, nitrate, oxalate, borate, phosphate, and sulphate.

Total Marks = 100 (Internal 40 + External 60)

Internal Marks Distribution:

Acid radical	= 15
Basic radical	= 15
Confirmatory test	= 05
Procedure	= 05

Total	= 40

External Marks Distribution:

Record	= 10
Acid radical	= 15
Basic radical	= 15
Confirmatory test	= 10 (5+5)
Procedure	= 10 (5+5)

Total	= 60

**PAPER-III
INORGANIC CHEMISTRY**

Semester :II
Hours/week :4
Credit :4

Subject code:
Total Hours/Semester:60

Objectives:

This course covers the basic and detailed aspects of s-block, p-block, d-block and f-block elements.

Unit-I: Group 1s and 2s-Block elements (12 hours)

- i) Hydrogen-Position of hydrogen in the periodic table-Isotopes of hydrogen- ortho and para hydrogen-Heavy water-Hydrogen peroxide-Liquid hydrogen as a fuel.
- ii) **Group 1s-Block elements:** Alkali metals-General characteristics-Gradation in physical properties-Density-Atomic volume, melting and boiling points-Ionisation energy-Electropositive character-Oxidation state-Reducing properties.
- iii) **Group 2s-Block elements:** Electronic configuration-Metallic properties-Melting and boiling points-Atomic radius, ionic radius-Atomic volume-Ionisation energy-Oxidation state-Flame colouration-Diagonal relationship between Be and Al.
- iv) **Compounds of alkaline earth metals:** Preparation, properties and uses of Magnesium sulphate (Epsom salt)-Calcium oxide (quick lime) Calcium sulphate (Plaster of paris.)

Unit-II: p-Block Elements-I (12 hours)

- i) **p-Block elements:** General characteristics – nature of oxide – nature of hydride – nature of halides.
- ii) **Group -13:** Boron group (B,Al,Ga,I,Te) - Electronic configuration – compounds of boron (borax) – borax bead test
- iii) **Group -14:** Carbon group(C,Si,Ge,Sn,Pb) - Electronic configuration – allotropic forms of carbon – structure of diamond – structure of graphite – structure of buckminster fullerenes – amorphous forms of carbon – uses of carbon and its compounds.
- iv) **Group-15:** Nitrogen group(N,P,As,Sb,Bi) - Electronic configuration - fixation of nitrogen – nitrogen cycle – uses of nitrogen compounds.

Unit-III: p-Block Elements – II (12 hours)

- (i) **Group 16:** Oxygen group(O,S,Se,Te,Po) - Electronic configuration – importance of molecular oxygen – nascent oxygen – oxides and its types – ozone – structure – ozone layer – uses of ozone.

- (ii) **Group 17:** halogen group (F,Cl,Br,I,At) - General characteristics in terms of physical and chemical properties-Interhalogen compounds-Structure, hybridization and shapes, ICl, BrF₃, ClF₅, IF₇.
- a) Hydrochloric acid-Lab preparation,its acidic nature-reaction with ammonia, carbonates and sulphites, formation of aqua regia and its uses.
- iii) **Group 18:** Noble gases-General characteristics-state, low reactivity, formation of Xenon compounds with fluorine and oxygen-equation, hybridization, shape and structure of compounds-Uses of noble gases.

Unit-IV: Transition Elements (12 hours)

- i) Introduction- general characteristics of d- block elements of 3d, 4d and 5d series-atomic radii, ionic radii, ionization potential, oxidation state, color and magnetic properties.
- ii) Compounds: Preparation properties and uses of silver nitrate – potassium permanganate - potassium dichromate.

Unit-V: Inner Transition Elements (12 hours)

- i) Introduction- general characteristics of f- block elements of 4f and 5f series-atomic radii, oxidation state, color and magnetic properties.
- ii) Lanthanide contraction and its consequences.
- iii) Differences between transition and inner transition elements.

Text Books:

1. P.R.Puri, L.R. Sharma, K.C . Kalia, “Principles of Inorganic Chemistry”, Vishal Publications, Jalandhar, 2001. [U-I: 360-382]
2. J. D. Lee, “Concise Inorganic Chemistry:”, Fifth Edition, Blackwell Science, USA, 2003. [U-II: 402,532,582,635]
3. Sathya prakash, G.D Tuli,S.K.Basu, R.D Madan, “ Advanced Inorganic Chemistry”, S.Chand

& Co, New Delhi, 2008. [U-III: 962-972, 980-983]

4. R.D.Madan, "Modern Inorganic Chemistry", S.Chand & Co, New Delhi, 2004.

[U-IV: 1347, U-V: 1358]

Reference Books:

1. P.L. Soni, "Text Book of Inorganic Chemistry", Sultan Chand & Co, New Delhi; 2004.
2. Wahid U.Malik, G.D Tuli, R.D Madan "Selected topics in Inorganic Chemistry", S.Chand & Co, New Delhi- 2002.
3. J. D. Lee, "Concise Inorganic Chemistry:", Second Edition, Blackwell Science, USA, 1964.

PAPER-IV ORGANIC AND PHYSICAL CHEMISTRY

Semester :II
Hours/week : 4
Credit : 4

Subject code :
Total Hours/Semester:60

Objectives:

Students undergoing this course acquire knowledge and understanding of aliphatic and aromatic hydrocarbons, hydroxy compounds, alkyl and aryl halides. The students also acquire an in-depth knowledge about gaseous state and colligative properties.

Unit-I: Aliphatic and aromatic hydrocarbons (12 hours)

a) Aliphatic Hydrocarbons:

i) Alkanes: Introduction: methods of preparation- by reduction of alkyl halides- by Wurtz reaction.

Reactions of Alkanes: halogenation, nitration and aromatisation [no mechanisms]

ii) Alkenes: Introduction; methods of preparation- by dehydrohalogenation of alkyl halides [Saytzeff's rule] - by heating quaternary ammonium hydroxide [Hofmann rule] - and by pyrolysis (cracking) of alkanes.

Reactions of alkenes: catalytic hydrogenation [Sabatier-Sendersen's reduction], addition of halogen acids, addition to unsymmetrical alkenes [Markovnikov rule] - Anti Markovnikov addition [Kharash Peroxide Effect], ozonolysis [no mechanism]

iii) Alkynes: Introduction- methods of preparation: by dehydrohalogenation of 1, 2-dihalides- by electrolysis of salts of unsaturated dicarboxylic acid

Reactions of alkynes: Acidity of alkynes- oxidation reaction with strong alkaline KMnO_4 , ozonolysis and polymerization reaction

b) Aromatic hydrocarbons:

i) Aromaticity- Huckel's rule- method of preparation from petroleum, from toluene - by hydrodealkylation and structural elucidation of benzene.

ii) Toluene: Preparation from n-heptane

Reactions: - electrophilic substitution reactions [with Cl_2 , H_2SO_4 , HNO_3] - substitution in CH_3 group (reaction with chlorine)

ii) Styrene: Preparation from benzene

Reactions: addition reaction with Br_2 - oxidation with KMnO_4

iii) Xylenes: Isolation of xylenes from naphtha, Oxidation of xylene with alkaline KMnO_4

iv) Polynuclear fused Hydrocarbon:

Naphthalene: preparation by Haworth synthesis

Reactions: sulphonation- ozonolysis- Friedel-Craft's alkylation- oxidation reactions; uses of naphthalene.

Unit-II: Hydroxy compounds

(12 hours)

- a) Classification - General formula and structure
 - i) **Aliphatic alcohol:** -Methods of preparation from hydration of alkenes-Direct hydration-Hydroboration oxidation-From Grignard's reagent-Hydrolysis of alkyl halides-Reduction of carboxylic acids-Manufacture of methanol by Bosch process and ethanol by fermentation of carbohydrates-Acidity of alcohol-Esterification with mechanism-Reaction with Hydrogen halides-Reaction with PCl_3 , PCl_5 and SOCl_2 -Reaction with acid chlorides and acid anhydrides-Oxidation-Dehydration with Mechanism-
 - ii) **Ethane 1,2-diol (Glycol):** Preparation of ethane-1,2 diol from ethane-Physical properties-Chemical properties-Oxidation to oxalic acid and reaction with HCl -
 - iii) **Propane-1,2,3-triol (Glycerol):** -preparation from soap-Physical properties-Chemical properties-Oxidation with KMnO_4 and reaction with oxalic acid.
 - iv) Difference between primary, secondary and tertiary alcohols
- b) **Aromatic alcohol:**
 - i) Phenols - Preparation of Phenol from diazonium salt, Chlorobenzene (Dow's Process) and benzene sulphonic acid-Manufacture from cumene-Physical properties-Acidic character of phenol-Chemical properties: Reaction with sodium hydroxide-Reaction with sodium, zinc, acetyl chloride, acetic anhydride and phosphorus penta chloride-Bromination,nitration and sulphonation-Kolbe's reaction-Reimer-Tiemann reation-Test for phenol.
 - ii) **Nitro phenol:** Picric acid only, preparation, properties and uses.
 - iii) **Dihydric phenol:**
 - (a) Catechol-Preparation from o-chloro phenol-Reactions with Fehling's solution, phthalic anhydride and uses.
 - (b) Resorcinol-Preparation from 1,3-benzene disulphonic acid-Reactions with phthalic anhydride and uses.

(c) Quinol-Preparation from p-benzoquinone-Oxidation reactions with ferric chloride and uses.

iv) **Trihydric phenol:** Pyragallol, phloroglucinol and hydroxyl quinol-Preparation and uses.

Unit-III: Alkyl and Aryl halides

(12 hours)

a) **Alkyl halides:**

- i) Preparation from alkane and halogen, alkene and hydrohalide, alcohols with PCl_3 , PCl_5 and SOCl_2 -Reactions with Sodium nitrite, silver nitrite, aq.sodium hydroxide and alcoholic potassium hydroxide-Uses of halogen derivatives of alkanes.
- ii) Preparation, properties and uses of the following: ethyl bromide, chloroform, iodoform and haloform reaction.

b) **Aryl halides:**

- i) Chlorobenzene-Preparation from aniline-Physical properties-Electrophilic substitution (Chlorination, nitration and sulphonation)-Nucleophilic substitution-Replacement of chlorine with $-\text{OH}$, $-\text{NH}_2$ -Reduction to benzene-Wurtz-Fittig reaction-Fittig reaction-Addition reaction with Magnesium-Formula of DDT-Organometallic compounds.
- ii) Organometallic compounds including Grignard's reagent, preparation and their uses. Wilkinson and Ziegler-Natta catalyst.

Unit-IV: Gaseous State

(12 hours)

- i) Four important measurable properties of gases- Pressure effect – Temperature effect – Volume effect – Number of moles of effect.
- ii) The gas laws – Boyle's law – Charle's law.
- iii) The equation of state for an ideal gas – standard temperature and pressure.
- iv) Numerical values of gas constant – in litre – atmospheres – in C.G.S system – in M.K.S. system.
- v) Daltons law of partial pressure – Graham's law of diffusion – Causes for deviation of real gas from ideal behavior.
- vi) VanderWall's equation of state-Critical Phenomena – Derivation of critical constants from Vanderwaals constants.

vii) Joule-Thomson effect and inversion temperature-Liquefaction of gases-Methods of liquefaction of gases (Linde's method).

Unit-V: Colligative Properties

(12 hours)

Colligative Properties: Introduction

- i) Lowering of vapour pressure - Raoult's law – determination of molecular weight from lowering of vapour pressure.
- ii) Depression of freezing point of dilute solution - determination of molecular weight from depression in freezing point - Beckmann method (measurement of freezing point depression).
- iii) Elevation of boiling point of dilute solution – determination of elevation of boiling point - Cottrell's method.
- iv) Osmosis in solution - Osmotic pressure – isotonic solution – laws – determination of molecular weight by osmotic pressure measurement – determination of osmotic pressure by Berkley-Hartley's method.
- v) Abnormal Colligative properties – dissociation of solute molecules – association of solute molecules.

Text Books:

1. B.S.Bahl & Arun Bahl, "Advanced Organic Chemistry", S.Chand & Co. New Delhi-2008. [U-I: 188-217,890-929,U-II: 351-407,1042-1080,U-III: 309-335,945-962]

2. B.R.Puri, L.R.Sharma, Madan S.Pathania, "Principles of Physical Chemistry", Shoban Lal Nagin Chand & Co, Jalandhar, 1998. [U-IV: 426-445,U-V: 725-747]
3. P.L.Soni, O.P Dharmarha and U.N.Dash, "Text Book of Physical Chemistry", Sultan Chand & Sons, New Delhi-1990. [U-IV: 1.269& 1.328-1.36, U-V: 2.41-2.80]

Reference Books:

1. K.S.Tewari, S.N.Mehrotra, N.K.Vishnoi, "A Text Book of Organic Chemistry" Vikas Publishing House Pvt Ltd, New Delhi-1987
2. I.L.Finar, "Organic Chemistry", Vol-I, Pearson Education-2003. [U-I:195,U-II:381-414]
3. R.L. Madan,"Simplified Course in Organic Chemistry", S.Chand & Co. New Delhi-2001.

ANCILLARY CHEMISTRY
PAPER II
GENERAL CHEMISTRY - II

Semester : II

Sub code:

Hours/ week:3

Total hours/ Semester: 45

Credit : 2

Objectives :

To impart fundamental knowledge related to

- Atomic Structure
- Periodic Table & Periodic Properties
- Colloidal State
- Polymers
- Medicinal Chemistry

Unit- I: Atomic Structure: (9 Hours)

Quantum numbers –atomic orbitals-shapes of orbitals- filling up of orbitals- Aufbau principle- Hund's rule-Pauli's exclusion principle- electronic configuration of all elements in the periodic table.

Unit- II: Periodic table & Periodic properties: (9 Hours)

- i) Long form of periodic table-classification of elements into s,p,d and f blocks.
- ii) Atomic radii, ionic radii, ionization potential, electron affinity, electro negativity and metallicity and non-metallicity and their periodic variations-interpretation of these variations based upon their electronic configuration.

Unit-III: The colloidal state (9 Hours)

- i) Introduction: Phases of colloids-classification of colloidal solutions- preparation (Dispersion methods only), purification, properties- optical property-Tyndal effect, Kinetic property-Brownian movement; Electrical properties-Electrical double layer, Electrophoresis, and Electro osmosis.
- ii) Applications of colloids: Colloidal medicine, smoke precipitation, artificial kidney machine, sewage disposal, purification of water, artificial rain.

Unit-IV: Polymers (9 Hours)

Definition-classification of polymers- properties of polymers- addition and condensation polymerization reactions with examples- natural rubber- synthetic rubber - vulcanization of rubber-

preparation and applications of polystyrene, urea- formaldehyde resin, Teflon and buna-S-rubber, neoprene and Bakelite.

Unit-V: Medicinal chemistry

(9 Hours)

Chemotherapy: Introduction;

- i) **Drug:** Definition – requirements of drugs – history of drugs.
- ii) **Terminology** in Drug Chemistry: Medicinal Chemistry – pharmacy – pharmacology – pharmacodynamics – pharmacophore – antimetabolite – bacteria – virus and fungi.
 - a) Anesthetics: Definition-classification with examples
 - b) Analgesics: Definition- classification with examples
 - c) Antibiotics-Definition-uses of penicillin, streptomycin, tetracycline and chloramphenicol
 - d) Antimalarial Drugs-Definition- mode of action- examples.

Text Books:

1. B.S. Bahl & Arun Bahl, “Advanced Organic Chemistry”, S. Chand & Co, Ramnagar, New Delhi, 110055, 2004
2. P.L. Soni, O.P.Dharmarha, U.N.Dash, “Text Book of Physical Chemistry”, Sultan & Sons, New Delhi, 2001
3. B.R.Puri, L.R.Sharma, Madan S.Pathania, “Principles of Physical Chemistry”, Shoban Lal Nagin Chand & Co, Jalandhar, 1998

Reference Books:

- 1.R.D. Madan, “Modern Inorganic Chemistry”, S. Chand & CO, New Delhi, 2004.
2. P.L. Soni, H.M. Chawla, “Text Book of Organic Chemistry”, Sultan & Sons, New Delhi, 2004.

PAPER-V
GENERAL CHEMISTRY - I

Semester :III

Subject code:

Hours/week:4
Credit :4

Total Hours/Semester:60

Objectives :

This course covers the solid state, radio activity, inorganic polymer, bioinorganic chemistry, aldehyde, ketones and ethers, carboxylic acid and acid derivatives.

Unit-I: Solid State (12 hours)

- (i) Types of solid-Isotropy and anisotropy- Symmetry in crystal systems-Space lattice-Unit cell-Seven crystal systems-Bravais lattice-Laws of crystallography-Law of constancy of interfacial angle, angle of symmetry-Law of rational indices-Miller indices.
- (ii) X-ray diffraction-Bragg's equation-Experimental methods and determination of interplanar spacing-X-ray spectrophotometer-The Debye and Scherrer method.
- (iii) Stoichiometric defects-Schottky defect-Frenkel defect.
- (iv) Non stoichiometric defects-Metal excess defects-Metal deficiency defects.

Unit-II: Radio activity (12 hours)

Radioactivity-Definition-Nature of radiations from radioactive substances-Comparison of the properties of α , β and γ radiations-Detection and measurements of radioactivity-Geiger-Muller counter-Radioactive decay-Group displacement law-Radioactive decay series-Artificial radioactivity-Nuclear fission-Atom bomb-Nuclear fusion-Hydrogen bomb-Application of radioactive isotopes.

Unit-III: Inorganic Polymer and Bioinorganic Chemistry (12 hours)

- (i) Inorganic polymers: Introduction-General properties of inorganic polymers-Boron based polymers-Polycarbonates-Polymeric boron nitride-Silicon based polymers-Polysilane gums and silicon rubber.
- (ii) Bioinorganic Chemistry: Role of metal ions (Fe, Co, Zn, Mg, Na, Ca, and K) in biological systems-Metallo porphyrins-Structure and functions of hemoglobin, myoglobin, chlorophyll, vitamin B₁₂ and cytochromes-Copper proteins.

Unit-IV: Aldehyde and Ketones and Ethers (12 hours)

- a) Aromatic aldehyde:**

i) Benzaldehyde: Methods of preparation of benzaldehyde- by oxidation of toluene- hydrolysis of benzal chlorides- by Gattermann- Koch reaction- by Gattermann aldehyde reaction- by Rosenmund reaction- by Stephen's reaction- by Grignard reaction-reactions of benzaldehyde: addition of sodium bisulphite- addition of Grignard reagents with ammonia NH_2OH , $\text{NH}_2\text{-NH}_2$, $\text{C}_6\text{H}_5\text{NHNH}_2$ - action of PCl_5 - reduction with sodium ethanol Zn /Hg-HCl , mechanism of Cannizzaro reaction, Claisen-Schmidt reaction, Perkin reaction, Knoevenagel reaction, Benzoin condensation with phenol and tertiary amine- reaction of aromatic nucleus: nitration sulphonation, halogenation- comparison of aliphatic and aromatic aldehydes

b) Aromatic Ketones:

i) Acetophenone: methods of preparation- by Friedel craft's reaction from benzene, Reactions: reduction Na/ethanol , Zn /Hg-HCl , chlorination, condensation, Mannich reaction-uses.

ii) Benzophenone: methods of preparation- by distilling calcium benzoate- by Friedel-craft's reaction- reactions: reduction- oxidation- reaction with potassium hydroxide, sodium and Michler's ketone.

c) Ethers: Introduction – Classification – isomerism.

i) Aliphatic ethers: Methods of preparation of aliphatic ethers – Dehydration of alcohol – Williamson's synthesis – From alkyl halides – Properties of ethers – halogenations – formation of peroxide – formation of oxonium salt – reaction with lewis acid – reaction with grignard reagent – reaction with HI – reaction with PCl_5 .

ii) Aromatic ethers: Methods of preparation of aromatic ethers – From williamson's synthesis – from diazone methane – Properties of ethers – with lewis acids – reaction with HI – Electrophilic substitution reaction.

iii) Distinction between aromatic and aliphatic ethers.

Unit-V: Carboxylic acids

(12 hours)

a) Aliphatic carboxylic acids:

i) mono carboxylic acid: Introduction- classification- methods of preparation: by oxidation of 1° alcohol and aldehyde- oxidation of methyl ketone(haloform reaction)- by hydrolysis of ester- by hydrolysis of nitrils- from alkyl substituted aceto acetic and malonic esters.

ii) Properties: solubility, b.pt and m.pt- stability of carboxylate ion, influence of substituents on acidity- reaction with sodium, NaOH, triethyl amine- reactions of salts of carboxylic acids [Na salt, ammonium salt, calcium salt]- reaction with alcohol- electrolysis- reaction with PCl₅ and PCl₃- reaction with P₂O₅- reduction with LiAlH₄- reaction with diazomethane- reaction with Cl₂, Br₂, ammonia, NaCN- test for acids- differences between formic acid and acetic acid

b) Aliphatic dicarboxylic acid:

i) Aliphatic dicarboxylic acid: introduction- methods of preparation: by oxidation of glycol with KMnO₄ - by oxidation of hydroxyl acids with K₂C₂O₇- by the hydrolysis of dinitrils or cyano mono carboxylic acid with dil. HCl- by the action of silver or Zn on halogenated mono carboxylic esters- by the electrolysis of salts of acid esters of lower dicarboxylic acid- by treating grignard reagent with solid CO₂- by the oxidation of unsaturated fatty acids with KMnO₄ - by the oxidation of cyclic alkenes and ketones [with HNO₃ or KMnO₄/OH⁻] - from aceto acetic ester- from malonic ester

ii) Properties: reaction of the COOH group

reaction with NaOH, C₂H₅OH/H⁺, NH₄OH, SOCl₂- action of heat on dicarboxylic acid [Blanc's rule]- oxidation with KMnO₄- acyloin reaction- halogenation[with Cl₂]

c) Aromatic acids: (i) benzoic acid (benzene carboxylic acid):

Introduction- methods of preparation: oxidation of benzyl alcohol & benzaldehyde- hydrolysis of nitrile- carbonation of Grignard reagent- oxidation of toluene with KMnO₄- hydrolysis of trichloro methyl group on benzene nucleus.

ii) Properties: Acidity- esterification- reaction of sodium benzoate- reaction with PCl₅- reaction with ammonia- decarboxylation- reduction with LiAlH₄- sodium amyl alcohol- reaction with Cl₂, nitric acid- uses.

(d) Benzene dicarboxylic acid: (Phthalic acid)

Introduction- methods of preparation of phthalic acid: from naphthalene- from o-xylene.

Properties: Action of heat - reaction with KOH/ Na amalgam.

e) Acid derivatives:

Definition with examples.

- i) Preparation and properties of acetic anhydride and urea
- ii) Preparation and properties of phthalic anhydride.

Text Books:

1. B.R. Puri, L.R. Sharma, K.C. Kalia, "Principles of Inorganic Chemistry", Milestone Publishers, Delhi, 2008. [U-I:210-265;U-III: 1121-1168]
2. R.D. Madan, "Modern Inorganic Chemistry", S.Chand and Company Ltd, New Delhi, 2008. [U-I:595-647;U-2:333-376;U-III: 967-977;1032-1047]
3. B.R. Puri, L.R. Sharma, Madan S. Pathania, "Principles of Physical Chemistry", Shoban Lal Nagin chand &Co, Jalandar, 1998.[U-II:88-110;111-146]
4. B.S. Bahl & Arun Bahl, "Advanced organic Chemistry", S.Chand&co, New Delhi, 2004. [U-IV:1081-1110,U-V:479-538;1111-1137;]

Reference Books:

1. J.D. Lee, "Concise Inorganic Chemistry", Blackwell Science Ltd, 3rd Edn.,-2003. [U-I:43-63;U-II: 909-935; U-III: 370-375;432-459;775-781]
2. Gary L. Miessler, Donald A. Tarr, "Inorganic Chemistry" Pearson Education, New Delhi, 3rdEdn, 2008. [U-I:211-236; U-III: 566-598;602-640;]
3. Wahid U. Malik, G.D. Tuli and R.D. Madan, "Selected Topics in Inorganic Chemistry", S.Chand &Co., New Delhi, 2002.
4. I.L. Finar, "Organic chemistry", Vol-I, Pearson Education, 2003.
5. R.K. Gupta, R.K. Amit, "Organic Chemistry", Arihant Prakasan-Meerut, 4th Edn, 2002.

MAJOR PRACTICAL-II

Course : II - B.Sc

Subject code:

Semester : III & IV

No of hours/week: 2

Practical : II

No of Credits: 3

Title of the Paper: Volumetric Analysis

(At the end of the SECOND YEAR)

Course Objectives:

To make the students to estimate the amount of substance present in the whole of the given solution. A double titration involving making up of the solution to be estimated and the preparation of a primary standard.

LIST OF EXPERIMENTS

a) Acidimetry and alkalimetry

S.NO	Standard solution	Link solution	Solution for estimation
1	Oxalic acid	Sodium hydroxide	Oxalic acid
2	Sodium carbonate	Hydrochloric acid	Sodium carbonate

b) Permanganometry

S.NO	Standard solution	Link solution	Solution for estimation
1	Ferrous ammonium sulphate	Potassium permanganate	Ferrous ammonium sulphate
2	Oxalic acid	Potassium permanganate	Ferrous ammonium sulphate
3	Oxalic acid	Potassium permanganate	Oxalic acid
4	Ferrous Sulphate	Potassium permanganate	Oxalic acid

c) Iodometry

S.NO	Standard solution	Link solution	Solution for estimation
1	Potassium dichromate	Thio	Potassium dichromate
2	Potassium dichromate	Thio	Copper sulphate
3	Oxalic acid	Sodium hydroxide (Titration-I), Potassium permanganate (Titration II)	Oxalic acid

Total Marks = 100 (Internal 40 + External 60)

Internal Marks Distribution:

Procedure	= 10
Estimation	= 30

Total	= 40

External Marks Distribution:

Record	= 10
Procedure	= 10
Estimation	= 40

Total	= 60

Distribution of marks:

Estimation (30 marks)
Error <1% - 30 marks
Error 1-2% -25 marks
Error 2-3% -20 marks
Error 3-4% -15 marks
Error >4% - 10 marks

Distribution of marks:

Estimation (40 marks)
Error <1% - 40 marks
Error 1-2% -35 marks
Error 2-3% -30 marks
Error 3-4% - 25 marks
Error >4% - 20 marks

GENERAL CHEMISTRY - III

Semester :III
Hours/week:3
Credit :2

Subject code:
Total Hours/Semester:45

Objectives :

To impart the fundamental knowledge related to

- Carbohydrates
- Petrochemicals
- Volumetric analysis
- Adsorption
- Chemical equilibrium and Chemical kinetics

Unit -I: Bio Chemistry-I (9 hours)

Carbohydrates:

Definition- classification with examples.

i) Monosaccharides:

Introduction- classification-preparation, properties and uses of glucose and fructose- conversion of glucose to fructose and vice versa-differences between them.

ii) Disaccharides:

Introduction- manufacture of sucrose from cane sugar- properties and uses- structure (no elucidation)- Distinction between sucrose, glucose and fructose

iii) Poly saccharides:

Introduction- Starch and cellulose, α -Amylose and β - Amylose (structure only)-differences between α -Amylose and β - Amylose.

Unit- II: Petroleum and Petrochemicals (9 hours)

i) Petroleum:

Introduction- occurrence- sources of petroleum in India- composition of petroleum- origin of petroleum- carbide theory- Engler's theory- refining of petroleum- increasing the yield of petrol - cracking- knocking and antiknocking- octane number- cetane number- flash point- Synthetic petrol- Fischer-Tropsch process.

ii) Petrochemicals:

Definition –different types of petrochemicals (a brief study only.)

Unit -III: Analytical Chemistry-I (9hours)

Volumetric methods of analysis:

i) Introduction- principle- terminology: molality, molarity, normality, mole fraction - titration- end point- indicator - types of indicators

Standard solution- types of standard solution- requirements of primary standard solution

ii) Acid-base titration:

Types- titration curves and choice of indicators- Ostwald's theory-theory of acid- base indicators.

iii) Redox titration:

Definition with examples- theory of redox indicators.

Unit -IV: Adsorption (9 hours)

Definition- adsorption- adsorbate- adsorbent- types of adsorption- physical adsorption- chemical adsorption- differences between these two types.

Factors influencing adsorption- nature of the gas- nature of the solid- temperature- pressure- adsorption of gases on solid surface-Applications of adsorption

Unit-V: Chemical Equilibrium and Chemical Kinetics (9 hours)

i) Chemical equilibrium:

Reversible and irreversible reactions- chemical equilibrium- law of mass action- equilibrium constant- applications of law of mass action- relation between K_p and K_c - Le-Chatelier- Braun principle and its applications in i) manufacture of NH_3 by Haber's process ii) manufacture of H_2SO_4 by contact process

ii) Chemical kinetics:

Rate of the reaction- rate law- rate constant- order and molecularity of reaction- differences between order and molecularity- derivation of rate constant and half life period for first order reaction.

Effect of temperature on reaction rate (Arrhenius theory of reaction rate)

Reference Books:

1. B.S. Bahl & Arun Bahl, "Advanced Organic Chemistry", S. Chand & Co, New Delhi, 2008
2. P.R.Puri, L.R. Sharma, K.C. Kalia, "Principles of Inorganic Chemistry", Milestone Publishers Delhi, 2008
3. P.L. Soni, O.P.Dharmarha, U.N.Dash, "Text Book of Physical Chemistry", Sultan & Sons, New Delhi, 2001
4. R.L.Madan, G.D.Tuli "Simplified Course in Inorganic Chemistry" S.Chand & Co, New Delhi 2001

Course : II - B.Sc Phy& Zoo

Semester : III & IV

Practical : II

Title of the Paper: Volumetric Analysis

Subject code:

No of hours/week: 2

No of Credit :1

(At the end of the SECOND YEAR)

Course Objectives:

A double titration involving making up of the solution to be estimated

.LIST OF EXPERIMENTS

a) Acidimetry and alkalimetry

S.NO	Standard solution	Link solution	Solution for estimation
1	Oxalic acid	Sodium hydroxide	Oxalic acid
2	Sodium carbonate	Hydrochloric acid	Sodium carbonate

b) Permanganometry

S.NO	Standard solution	Link solution	Solution for estimation
1	Ferrous ammonium sulphate	Potassium permanganate	Ferrous ammonium sulphate
2	Oxalic acid	Potassium permanganate	Ferrous ammonium sulphate
3	Oxalic acid	Potassium permanganate	Oxalic acid
4	Ferrous Sulphate	Potassiumpermanganate	Oxalic acid

c) Iodometry and dichrometry

S.NO	Standard solution	Link solution	Solution for estimation
1	Potassium dichromate	Thio	Potassium dichromate
2	Potassium dichromate	Thio	Copper sulphate

Total Marks = 100 (Internal 40 + External 60)

Internal Marks Distribution:

Procedure	= 10
Estimation	= 30

Total	= 40

External Marks Distribution:

Record	= 10
Procedure	= 10
Estimation	= 40

Total	= 60

Distribution of marks:

Estimation (30 marks)
Error <1% - 30 marks
Error 1-2% -25 marks
Error 2-3% -20 marks
Error 3-4% -15 marks
Error >4% - 10 marks

Distribution of marks:

Estimation (40 marks)
Error <1% - 40 marks
Error 1-2% -35 marks
Error 2-3% -30 marks
Error 3-4% - 25 marks
Error >4% - 20 marks

Semester :III
Credit :3

Subject code:

Objectives:

To create an awareness about the diet pattern, healthy food, water and minerals, food processing, food additives and the test to identify the adulterants.

Unit -I: Food, Nutrition and Health

The meaning of the food – what is health – nutrients – classification of food – nutritional status and care – malnutrition – global problems of nutrition – the body composition and the nutrients – amount of nutrients in the body – functions of food – metabolism – cell as a functional unit – digestion – digestion in the mouth – digestion in the stomach – digestion in the intestine – absorption – intermediary metabolism – the science of nutrition.

Unit -II: Minerals and Water

- (i) **Water:** Introduction – water, a nutrient – water: vital link to life – water balance – is there a daily requirement – water sources – special need – six basic rules for fluid replacement during sports events.
- (ii) **Minerals:** Estimation of minerals – estimation of sodium – estimation of potassium – estimation of calcium - estimation of iron - estimation of phosphorus - estimation of magnesium - estimation of copper - estimation of water content - estimation of ash content.

Unit -III: Food Processing

Introduction – cooking – cooking methods – effect of cooking on nutrients – effect of cooking on various foodstuff – food spoilage – food preservation – refrigeration and freezing – canning – dehydration – an experiment in freeze-drying.

Unit IV: Food Additives

Introduction- The Chemistry of Sweeteners – Intense Sweeteners – Bulk Sweeteners

Chemistry of food colours – Natural Colours – Nature Colours – Synthetic Colours-
How much Colouring should be in food? Safety – Flavouring Agents – Antioxidants-
Chemistry of Antioxidants- Emulsifiers- foodstuff containing Emulsifiers- Type of
Emulsions – Manufacture of Emulsifiers- Functions of Emulsifiers in food –
Acidulants – Acetic acid – Citric acid – Lactic acid – malic acid –Phosphoric acid –
Tartaric acid.

Unit – V : Food Adulteration and Testing

Introduction – Legal Aspects of food adulteration and Prevention – Common food
adulterants – ill-effects of food adulterants - Analysis of Various food adulterants –
analysis of Adulterants in Edible - oils – Analysis of Adulterants in Ghee- Analysis of
adulterants in Coffee Powder - Analysis of Adulterants in Chilly Powder – Analysis of
adulterants in Turmeric Powder – Analysis of Adulterants in meat – Analysis of
adulterants in milk – Harmful Effects of the Adulterants – food additives – Sweeteners
–preservatives – flavours – colourants – Pesticide contaminants – Toxicants.

Reference Book:

1. Alex V.Ramani ,’’ Food Chemistry’’, MJP Publishers, Chennai-2009. [U-I: 1-18,U-II: 135-158,U-III: 161-190,U-IV: 193-214,U-V: 219-228].
2. H.D. Belitz, W. Grosch, D. Schieberle, “Food Chemistry” CBS- Publishers 3rd revised edition, 1980.

DAIRY SCIENCE

Semester :III
Hours/week:2
Credit :2

Subject code:
Total Hours/Semester:30

Objectives :

To understand the chemistry of milk and milk products and get appointment in dairy units of both private and Government and also enable them to start dairy units.

Unit-I (6 hours)

Introduction- composition of milk- physical properties- functional properties-effect of heat on milk-check for purity of milk-detection of adulteration in milk.

Unit-II (6 hours)

Milk Processing: Introduction- different methods of processing of milk -clarification- pasteurization- VHT milk- HTST milk- homogenized milk.

Unit-III (6 hours)

Milk Powder Processing: Introduction- skimmed milk powder-whole dry milk powder-manufacture of whole dry milk powder-butter milk powder.

Unit-IV (6 hours)

Milk Products-I

i) **Butter:** Introduction- preparation process-chemical nature of butter fat-detection of adulteration in butter.

ii) **Cheese:** Introduction- preparation- composition- un-ripened cheese- ripened cheese-processed cheese.

Unit-V

(6 hours)

Milk Products II

i) Ghee: Introduction-manufacturing process-detection of adulteration in ghee.

ii) Ice-Cream:Composition-milk fat-milk solid- non fat- sweeteners- stabilizers- emulsifiers.

Field work: Visit to a Dairy unit/farm and submission of report.

Reference Books:

1. K.Bagavathi Sundari, "Applied Chemistry" MJP Publishers, Chennai-2006
2. Lillian Hoauland Meyer, "Food Chemistry" CBS Publishers and Distributors, Delhi,
1987
3. R.Gopalan, P.S.Subramanian, K.Rengarajan, "Elements of Analytical Chemistry",
Sultan Chand & Sons, New Delhi, 2003

Semester :IV
Hours/week :4
Credit :4

Subject code:
Total Hours/Semester:60

Objectives:

This course covers the chemical equilibrium, distribution law, chemical kinetics, catalysis, surface chemistry, coordination compounds and isomerism.

Unit-I: Chemical Equilibrium and Distribution Law (12 hours)

- i) Chemical equilibrium: Reversible and irreversible reactions-Chemical equilibrium-Law of mass action-Relationship between K_c and K_p -Applications of law of mass action in the synthesis of hydrogen iodide and thermal decomposition of phosphorous pentachloride-Calculation of degree of dissociation from vapour density measurements.
Le Chatelier-Braun principle-Effect of temperature, pressure, concentration and addition of an inert gas-Application of Le Chatelier-Braun principle-Haber's process-Contact process.
- ii) Distribution law: Nernst distribution law-Conditions for validity of distribution law-Different cases of distribution law-Applications of distribution law-Principle of solvent extraction-Calculation of equilibrium constant-Association of a solute and dissociation of a solute.

Unit-II: Chemical Kinetics (12 hours)

- i) Introduction-Terminology:Rate of reaction, rate law, rate constant, order and molecularity of a reaction; Difference between order and molecularity.
- ii) First order reactions:Derivation of rate constant and half-life period-Examples of first order reactions-Catalytic decomposition of hydrogen peroxide-Pseudo first order reaction-Acid hydrolysis of an ester and inversion of sucrose.
- iii) Second order reactions: Derivation of rate constant-Hydrolysis of an ester by alkali.
- iv) Zero and fractional order reactions-Methods of determination of order of reaction-half life and graphical method.
- v) **Effect of temperature on reaction rate:** The Arrhenius equation-Significance of energy of activation.
- vi) **Theories of reaction rate:** Transition state theory and absolute reaction rate theory.

Unit-III: Catalysis and Surface Chemistry (12 hours)

- i) **Catalysis:** Definition-Homogeneous and heterogeneous catalysis, positive and negative catalysts-Characteristics of catalyst-Auto catalyst-Acid-base catalyst-Enzyme catalyst-Examples-Mechanism (Theory) of catalysts-Intermediate compound and formation theory and adsorption theory.
- ii) **Surface Chemistry:** Definitions-Adsorption, adsorbate and adsorbent-Types of adsorption-Difference between physisorption and chemisorptions-Adsorption of gases on solids-Factors affecting adsorption-Adsorption isotherm-Freundlich and Langmuir adsorption isotherms-Significance of Gibb's adsorption isotherm-Application of adsorption.

Unit-IV: Coordination Compounds (12 hours)

Introduction-Nomenclature-Isomerism in complexes-Geometrical and optical-Werner's theory-EAN rule-Valence Bond Theory-Low spin and high spin complexes-Magnetic properties-Limitations of VB theory-Crystal Field Theory-Octahedral and square planar complexes-Colour of coordination complexes- Metal carbonyls-Bonding and structure of $\text{Ni}(\text{CO})_4$, $\text{Fe}(\text{CO})_5$, $\text{Cr}(\text{CO})_6$, $\text{Fe}_2(\text{CO})_9$ and $\text{Co}_2(\text{CO})_8$.

Unit-V: Isomerism (12 hours)

a) **Geometrical isomerism-** Explanation- geometrical isomerism of maleic and fumaric acids – aldoximes and ketoximes- E-Z notations.

b) **Optical isomerism:** Optical activity-definition-condition for optical activity – optical isomerism of lactic and tartaric acids- enantiomers and diastereomers- racemization- resolution of racemic mixture- Walden inversion- asymmetric synthesis.

Optical activity of compounds without asymmetric carbon atoms: allenes, spiranes and biphenyl compounds.

Text Books:

1. B.R. Puri, L.R. Sharma, Madan S. Pathania, Principles of Physical Chemistry”, Shoban lal Nagin chand &Co, Jalandar, 1998. [U-I:566-613;865-875; U-II: 614-712;U-III: 713-735;1145-1169]

2. P.L. Soni, O.P. Dharmarha, U.N. Dash, "Text book of physical Chemistry" Sultan chand & sons, New Delhi, 22nd Edn, 2005. [U-I:1.615-1.644;1.651-1.667; U-II: 2.165-2.216;U-III: 2.270-2.298;2.93-2.118]
3. B.R. Puri, L.R. Sharma, K.C. Kalia, "Principles of Inorganic Chemistry", Milestone Publishers, Delhi, 2008.[U-IV: 873-911;1089-1120]
4. B.S. Bahl & Arun Bahl, "Advanced organic Chemistry", S.Chand&co, New Delhi, 2004. [U-V: 116-144.]

Reference Books:

1. Gurddep raj, "Advanced Physical Chemistry", Goel Publications, Meerut-1992. [U-I:1303-1383;1090-1106;U-II:659-784;U-III:841-872;873-932]
2. P.W. Atkins, "Physical Chemistry", Oxford university press, 6th Edn., 1998. [U-I:215-241;U-II:761-789;U-III:849-868]
3. P.L. Soni,"Text book of Inorganic Chemistry",Sultan Chand & Sons, New Delhi, Revised Edn., 1991. [U-III:3.22-3.79;3.227-3.223]

ANCILLARY CHEMISTRY
PAPER – IV
GENERAL CHEMISTRY - IV

Semester :IV

Subject code:

Hours/week:3
Credit :2

Total Hours/Semester:45

Objectives: To enable students to understand the fundamental concepts in

- Analytical chemistry
- Photo chemistry and photochemical reactions
- Bio chemistry
- Agricultural chemistry
- Silicate industry

Unit -I: Analytical Chemistry-I (9 hours)

i) Chromatography:

Definition- principle of chromatography- types of chromatography- experimental techniques and applications of column chromatography- thin layer chromatography and paper chromatography- R_f value and factors affecting R_f value

ii) Colorimetric method of analysis:

Introduction- principle- Beer- Lambert's law- merits and demerits- criteria for satisfactory colorimetric estimations- visual colorimetric- balance method- Duboscq colorimeter- estimation of Fe^{3+} ion

Unit -II: Photo Chemistry (9 hours)

Introduction- differences between thermal and photochemical reactions- laws of photochemistry- Grotthus- Draper law and Einstein's law- quantum efficiency. High and low quantum efficiency Jablonski diagram.

Photochemical reactions:

Luminescence-fluorescence-phosphorescence- chemiluminescence, bioluminescence and photosensitisation

Unit -III: Biochemistry-II (9 hours)

i) Amino acids and peptides:

Introduction- classification- essential and non-essential aminoacids- properties of amino acids.

Peptides- types and formation of peptides

ii) Proteins:

Introduction- classification i) according to composition ii) according to functions- structure of proteins- properties of proteins-colloidal nature-isoelectric point- coagulation-precipitation (denaturation)- hydrolysis. Colour tests for proteins- industrial importance of proteins.

Unit -IV: Agricultural Chemistry (9 hours)

i) Fertilizers:

Definition- nutrients for plants- role of various elements in plant growth- requirements of a good fertilizer- natural and chemical fertilizer- classification of chemical fertilizers- manufacture and uses of urea- super phosphate and potassium nitrate- mixed fertilizer

ii) Insecticides, Fungicides and Pesticides:

Definition- classification according to method of applications and actions-preparation and uses of D.D.T, B.H.C, Lead arsenate, Bordeaux mixture – natural insecticides.

Unit -V: Silicate Industry (9 hours)

i) Cement:

Introduction- composition of cement- raw materials- manufacture of cement by wet process- curing of cement- role of gypsum in setting of cement

ii) Glass:

Introduction- composition of glass- raw materials-methods of manufacture- types of glasses.

iii) Ceramics:

Introduction- raw materials- methods of manufacture and uses.

Reference Books:

1. B.S. Bahl & Arun Bahl, "Advanced Organic Chemistry", S. Chand & Co, New Delhi, 2008
2. P.L. Soni, O.P.Dharmarha, U.N.Dash, "Text Book of Physical Chemistry", Sultan &

Sons, New Delhi, 2001

3. R.L.Madan, G.D.Tuli “Simplified Course in Inorganic Chemistry” S.Chand & Co,
New Delhi 2001

4. P.R.Puri, L.R. Sharma, K.C. Kalia, “Principles of Inorganic Chemistry”, Shobal Lal
Nagin Chand & Co, New Delhi, 1993.

5. Dr. B.K.Sharma, “Industrial Chemistry”, Goel Publishing House, Meerut 1999.

**SELF STUDY
PAPER II
FORENSIC CHEMISTRY**

Semester : IV

Sub code:

Extra Credit: 3

Objectives:

- To acquire knowledge about the concept of Chemistry as related to forensic science.
- To understand the use of chemicals in criminal investigation.

Unit-I: Collection and Preservation of Evidences

i) Introduction- historical development of forensic science; types of physical evidence- importance of physical evidence- collection and preservation of physical evidence- identification of physical evidence.

ii) Forensic characteristics of glass and soil

iii) Forensic examination of hair, fibre and paints

Unit-II: Examination and Identification of Drugs, Alcohol and Poisons

i) Drug abuse- effects of marijuana and LSD.

ii) Alcohol-effect of the amount of alcohol consumed-analysis of alcohol by breathalyzer (a detailed study).

iii) Poisons- types and classification of poison - diagnosis of poisons in the living and the dead- clinical symptoms- - identification of phenol, chloral, HCN, alkaloids, and arsenic poisons.

Unit-III: Finger Print and Forensic Serology

i) Finger prints- principles- detection and preservation of developed finger prints – foot prints

ii) Forensic Serology-blood types- characterization of blood strains- preservation of blood evidence.

iii) Analysis of seminal stains.

Unit-IV: Crime Detection

i) Document and voice examination-hand writing comparison- collection of hand writing exemplars- typewriting comparisons- voice examination-sound spectrograph.

ii) Human bombs- possible explosives (gelatin sticks and RDX) – metal detector devices

Unit- V: Forgery and Counterfeiting

- i) Detecting forgery in bank cheques/drafts and educational records like mark sheet, certificate using UV light. Alloy analysis using AAS to detect counterfeit coins.
- ii) Checking silverline water mark in currency notes.
- iii) Detecting of gold purity in 22 carat ornaments and detecting gold plated jewels.
- iv) Cyber crimes

Reference book:

1. Dr.S.Shailaja, Dr. G Valli, Mrs.D.Rajamani,"Forensic science", The Standard Fireworks Rajaratnam College for Women, Sivakasi.

NON- MAJOR ELECTIVE (NME)
PAPER-II
SMALL SCALE INDUSTRIAL CHEMICALS

Semester :IV

Sub code:

Hours/week : 2

Total Hours/ Semester : 30

Course Objectives:

This course helps the students to understand the manufacturing technique of some of the small-scale industrial chemicals and thus enable them to start small scale manufacturing units.

Unit -I: Detergent Powder and Washing Powder (6 hours)

i) Detergent powder: Introduction- raw materials – manufacturing methods- advantage and disadvantages of detergents over soaps.

ii) Washing powder: Introduction- raw materials- method of manufacturing.

Unit -II: Chalk and Crayons (6 hours)

Introduction- materials for manufacturing- manufacturing processes.

Unit- III: Candles (6 hours)

Introduction- raw materials- manufacturing method of candles- manufacturing of fragrant candles and candles that can destroy mosquitoes- method of manufacture of superior candles.

Unit -IV: Phenoils, Incense stick and Dhuna(Sambirani) (6 hours)

i) Phenoils: Introduction- raw materials used - methods of preparation.

ii) Incense stick: Introduction- raw materials- manufacturing process.

iii) Dhuna/ Sambrani: Introduction- raw materials- method of manufacturing.

Unit-V: Ink (6 hours)

Introduction- different types of inks- methods of preparation of blue black liquid ink, fountain pen ink, red ink and rubber stamp ink- ink remover.

Note: 1. Practical training for the preparation of the above said products will be provided

in the Chemistry Department Laboratory

2. Visit to a small-scale manufacturing unit and submission of report.

Reference Book:

1. Preparative materials supplied by J.C. Kumarappa Institute of Rural Technology and Development , T. Kallupatti.
2. B.K. Sharma, "Industrial Chemistry" Goel Publishing House, Meerut, 1999.

Semester : V

Hours/week : 5

Credit : 5

Subject code:

Total Hours/Semester: 75

Objectives:

This course covers the basic and detailed aspects of thermodynamics, phase rule, physical properties and chemical constitution, colloidal state and group theory.

Unit-I: Thermodynamics-I (15 hours)

i) Thermodynamics: Importance of thermodynamics – limitations of thermodynamics - concepts of a system and surrounding - state variables - extensive and intensive properties –state function and their differential (exact and inexact) - different types of processes - isothermal, adiabatic, isobaric, isochoric, reversible, irreversible and cyclic.

ii) First law of thermodynamics: statement, mathematical expression - enthalpy and energy of a system - heat capacity at constant P and V- correlation between C_p and C_v - work done in reversible isothermal compression – maximum work – work done in irreversible isothermal expansion and adiabatic expansion.

Enthalpy of combustion – bomb calorimeter – bond energies – enthalpy of neutralization – enthalpy of formation – standard enthalpy of formation – enthalpy of solution – Hess's law of heat of summation and its application – Kirchoff's equation.

iii) Zeroth law of thermodynamics and its significance

Unit-II: Thermodynamics-II (15 hours)

i) Second law of Thermodynamics: Need for second law-different forms of second law - Carnot cycle and as a state function – entropy changes in reversible and irreversible process - Clausius inequality – calculation of entropy change of an ideal gas with change in P,V & T – entropy of mixing – physical significance of entropy – work function and free energy – variation of free energy change with temperature and pressure – Maxwell's relationships - Gibbs-Helmholtz equation - Clausius-Clapeyron equation – application of Clausius-Clapeyron equation - Van't Hoff isotherm - Van't Hoff isochore equation.

ii) Third law and zeroth law of thermodynamics:

Nernst heat theorem – Statement of Third law of Thermodynamics, determination of absolute entropy of solid, liquid and gas – experimental verification of third law – entropy changes in chemical reaction residual entropy – exceptions to third law – definition of zeroth law of thermodynamics.

Unit-III: Phase rule (15 hours)

- i) Statement and significance of the terms involved - derivation of phase rule from thermodynamic derivation- Gibb's phase rule to one-component system (water, sulphur system only)
- ii) Two component systems - simple eutectic system (lead-silver system only) - compound formation - congruent melting point (Zn-Mg system only)-incongruent melting point (Na-K system only) - salt hydrates (FeCl₃-H₂O system only).
- iii) Thermodynamics of ideal solutions - Henry's law, Raoult's law - Binary liquid systems- partially miscible (phenol-water system), completely miscible and completely immiscible system-theory of fractional distillation and steam distillation.

Unit-IV: Physical Properties and Chemical Constitution (15 hours)

- (i) Nature of cohesive forces in liquid – Trouton' rule and its significance.
- (ii) Molar volume and its applications.
- (iii) Surface tension – influence of temperature on surface tension – parachor – atomic structural parachors – applications.
- (iv) Viscosity – influence of temperature on viscosity – relation to chemical constitution - molecular viscosity – atomic and structural viscosity – Rheochor.
- (v) Refraction - refractive index – specific refractive index – molar, atomic and structural refraction – applications – liquid crystal – their applications.
- (vi) Dipole moment – definition – electrical polarization of molecule – Classius Mosotti equation – Debye equation – experimental determination – applications.
- (vii) Magnetic moment – magnetic susceptibility – para,dia and ferro magnetism – specific, molar magnetic susceptibility and constitution – determination by Gouy's method – applications.
- (viii) Solutions – definition – types of solutions – solubility – determination of concentration of solutions expressed in various scales – percentage, molarity, molality and normality – diffusion in solutions.

Unit-V: The Colloidal State and Group Theory

(15 hours)

a) Colloidal State:

- i) Definition-various types of colloidal dispersion-classification of colloids-preparation of colloidal solutions-condensation method (double decomposition, hydrolysis, oxidation, and reduction)-dispersion methods (Bredig's method, peptization)
- ii) Purification of colloids (dialysis, ultra filtration)
- iii) Properties of colloids-optical properties (Tyndall effect, Brownian movement)-electrical properties (charge of colloidal particles, electrical double layer, zeta potential, electrophoresis)
- iv) Applications of colloids (Cottrell precipitator, sewage disposal, artificial rain, artificial kidney machine, blood, purification of water).

b) Group theory:

Introduction-symmetry elements and symmetry operations- rules of a group, order of a group – types of groups - classes and similarity transformation- point group classification ($C_2H_6, H_2O, NH_3, CH_2=CH_2, C_6H_6, CH_4$) – matrix representation of symmetry operation (reflection) – reducible and irreducible representation (definition only)- construction of character table (C_{2v} only) .

Text Books:

1. P.L.Soni, O.P.Dharmarha, "Text Book of Physical Chemistry", Sultan Chand & Sons.

New Delhi-2001. [U-I: 1.466-1.509,U-II:1.549-1.596,U-III:1.673-1.701,U-IV:2.659-2.706]

2. B.R. Puri and L.R. Sharma, "A Text Book of Physical Chemistry", Vallabh Publications, 2004-05. [U-V:196-214,1141-1178]
3. P.K. Bhattacharya, "Group Theory and applications", Himalaya Publishing House-1996. [U-V:1-53].

Reference Books:

1. Gurdeep Raj, "Advanced Physical Chemistry", Goel Publications, Meerut-1992.
2. V. Ramakrishnan and M.S. Gopinathan "Group Theory in Chemistry", Vishal Publishing Co-2007.

MAJOR ELECTIVE-I ORGANIC CHEMISTRY-I

Semester : V

Subject code:

Hours/week : 5

Total Hours/Semester: 75

Credit : 5

Objectives:

- 1) To acquire knowledge related to derivatives of amino acids, proteins, nucleic acids, vitamins hormones, enzymes, oil, detergents and dyes, organic nitrogen compounds, alkaloids and terpenoids.
- 2) To understand the concept of conformation and conformational analysis.

Unit-I: Amino acids, Proteins, Nucleic acids and Vitamins: (15 Hours)

i) Amino acids: Definition- classification- synthesis of α -amino acid (Gabriel synthesis, Koop synthesis)- properties of amino acids (isoelectric point, action of heat and ninhydrin).

ii) Proteins: Definition- classification (simple and conjugated proteins) - properties of proteins (colloidal nature, isoelectric point, denaturation, hydrolysis)- colour tests for proteins (biuret test, ninhydrin test)- structure of proteins (primary, secondary, tertiary and quaternary).

iii) Nucleic acids: Definition- nucleosides- nucleotides- function of nucleotides- nucleotide as energy carriers- types of nucleic acids- structure of DNA- replication of DNA- functions of DNA-structure and functions of RNA- biological aspects of ageing.

iv) Vitamins: Definition- classification- source- function and deficiency disease of vitamins A, B complex, C, D, E and K.

Unit-II: Hormones, Enzymes Oil and Detergents and Dyes (15 Hours)

i) Hormones: Definition- classification- main functions of following hormones- Adrenaline, Cortisone, Testosterone, Estrone, Insulin, pituitary hormones and thyroxin. Differences between hormones and vitamins.

ii) Enzymes: Definition – classification- coenzyme- mechanism of enzyme action- factors influencing enzyme activity- enzyme inhibition (competitive inhibitor, non-competitive inhibitor and end product inhibition)- role of enzymes in the digestion of food.

iii) Oils and Detergents: Introduction – (saponification value, acid value, iodine value, Reichert – Meissal value) Definition and their determination – Applications – manufacture of soap – detergents- cleansing action of soap and detergents.

iv) Dyes:

- i) Definition - theory of Colour and Constitution** (Witt's Theory of colour and Modern Theory of colour).
- ii) Classification of Dyes:** Classification according to chemical structure and method of application.
- iii) Preparation and uses of** methyl orange, congo red, bismark brown, diphenylmethane dye (Auramine O), malachite green, rosaniline, crystal violet, fluorescein, phenolphthalein, indigo and alizarin.

Unit – III: Organic Nitrogen Compounds (15Hours)

I. Aliphatic nitrogen compounds:

a) Cyanides & Isocyanides:

- i) Alkyl cyanide:** preparation from alkyl halides.
- ii) Alkyl isocyanide:** preparation: from primary amine.
- iii)** Distinction between ethyl cyanide and ethyl isocyanides.

b) Nitro alkanes and alkyl nitrites:

- i) Nitro ethane:** preparation from Vapour Phase Nitration.
- ii) Alkyl nitrite:** preparation from sodium nitrite and ethyl alcohol
- iii)** Difference between nitro ethane and ethyl nitrite.

b) Aromatic nitro compounds:

- i) Nitrobenzene:** preparation from benzene-properties: reduction with Sn/HCl, Zn/ NaOH and ethanol, Zn/ NH₄Cl and H₂O and electrolytic reduction.
- ii) o-Dinitrobenzene:** preparation from o-nitro aniline-reaction with aqueous sodium hydroxide, ammonia/ethanol.
- iii) m-Dinitrobenzene:** preparation from nitrobenzene-properties: reduction with ammonium sulphide, reaction with NaOH and K₃ [Fe(CN)₆].
- iv) p-Dinitrobenzene:** preparation from p-nitro aniline-properties: reduction with ammonium sulphide.

b) Aliphatic amines:

- i)** Introduction-classification-methods of preparation of primary amine- from phthalimide-methods of preparation of secondary amines-reduction of alkylisocyanide-methods of

preparation of tertiary amines from quaternary ammonium sulphate, separation of mixture of amines (Hoffmann method, Hinsberg method)

ii) Distinction between primary, secondary and tertiary amines.

d) Aromatic amines:

(i) Introduction-classification-ammonolysis of aryl halides-properties - nitrous acid, carbylamine reaction, aldehydes, CS₂- Comparison of basicity of amines.

e) Alkylamines:

Benzyl amine: preparation from benzyl chloride, phenyl cyanide -properties: reduction, reaction with nitrous acid and oxidation.

f) Diazo Compounds:

(a) Aliphatic diazo compounds:

(i) **Diazomethane:** Introduction-preparation from N-nitroso-N-methyl urea, nitrous oxide-properties: reduction, alcohols, amines, carbonyl compounds, addition to ethylene and acetylene.

(ii) **Diazoacetic ester:** preparation from ethylglycine hydrochloride-properties: reactions with water, hydrochloric acid, acetic acid, ethanol, iodine and ethylene and acetylene reduction.

iii) Aromatic Diazo compounds.

Benzene diazonium chloride: Introduction-diazotization-preparation from aniline-properties: replacement by hydrogen, chlorine, iodine, fluorine, cyano group, nitro group, hydroxyl group, alkoxy group, reduction and coupling reaction

Unit-IV: Alkaloids and Terpenoids (15 hours)

i) Alkaloids: Definition- occurrence- classification of alkaloids -extraction of alkaloids-general methods of determining the structure of alkaloids- -structure and synthesis of the following alkaloids: atropine, papaverine, coniine, piperine and nicotine.

ii) Terpenoids: Definition- occurrence- classification- - isolation- isoprene rule- general properties- -general methods of determining structure- and structural elucidation of citral, geraniol, terpeniol, menthol and dipentene.

Unit – V: Alicyclic Compounds and Conformational Analysis (15 Hours)

i) Alicyclic compounds: Introduction-nomenclature-preparation: from dihalogen compounds, calcium salts of carboxylic acids, Dieckmann reaction-properties: reactions with halogens, halogen acids, reduction, oxidation, rearrangement reaction- relative stability of cycloalkanes – Bayer’s strain theory and its modification.

ii) Conformational analysis: Definition-differences between conformation and configuration-conformations and stability of ethane, n-butane, 1, 2-dichloroethane, cyclohexane and methyl cyclohexane.

Text Books:

1. P.L.Soni, H.M.Chawla, “Text Book of Organic Chemistry”, Sultan Chand & Sons. New Delhi-1990. [U-I: 3.219-3.251,U-II:2.291-2.309,U-III:2.311-2.332,2.559-2.595, U-IV:3.176- 3.215]
2. K.S.Tewari, S.N.Mehrotra, N.K.Vishnoi, “A Text Book of Organic Chemistry” Vikas Publishing House Pvt Ltd, New Delhi-1987. [U-I: 1189-1238,U-II:1352-1358, 1239-1248,1270- 1297,U-III: 813-910,U-IV:1324-1351,U-V: 216-228]

Reference Books:

1. B.S.Bahl & Arun Bahl, “Advanced Organic Chemistry”, S.Chand & Co. New Delhi-2008.
2. I.L.Finar, “Organic Chemistry”, Vol-I, Pearson Education-2003.

APPLIED CHEMISTRY

Semester : V
Hours/week :5
Credit :5

Subject code:
Total Hours/Semester: 75

Objectives:

This course covers the basic and detailed aspects of match industry explosives and sugar industry. Silicate industry, agricultural industry, rubber, plastic, paper and textile industry.

Unit – I: Match industry, Explosives and Sugar industry (15 hours)

- i) **Match industry:** Introduction – types of matches – raw materials need for safety matches – manufacturing process.
- ii) **Explosives:** Introduction – classification – characteristics of explosives – preparation and uses of TNT, picric acid, dynamite, cordite and RDX.
- iii) **Sugar industry:** Introduction – manufacture of cane sugar – extraction of juice – purification of juice – defecation sulphitation and carbonation – concentration – crystallisation – separation of crystals – drying – refining – sugar industry in India.

Unit – II: Silicate industry (15 hours)

- i) **Cement:** Introduction – composition of cement – raw materials need for manufacturing of Portland cement – manufacture of Portland cement by wet process and dry process – role of gypsum in the setting of cement – curing of mortars and concrete.
- ii) **Glass:** Introduction – characteristics of glass – composition of glass – raw materials and method of manufacture (tank furnace method) – types of glasses.
- iii) **Ceramics:** Introduction – general properties of ceramics – raw materials and manufacturing process.

Unit – III: Agricultural Chemistry (15 hours)

- i) **Fertilizer:** Introduction – macro and micro plant nutrients – role of various elements in plant growth – requirements of a good fertilizer.

Classification of chemical fertilizers: manufacturing methods and applications of following fertilizers: urea, super phosphate of lime, calcium cyanamide, calcium ammonium nitrate and mixed fertilizers.

ii) Insecticides and fungicides

i) Insecticides: Introduction – classification according to the mode of action – preparation and applications of DDT, BHC, gammexane, malathion, parathion and lead arsenate.

ii) Fungicides: Introduction – preparation and applications of thio carbamate and bordeaux mixture.

Unit – IV: Rubber, Plastic and Paper industries (15 hours)

i) Rubber : Introduction – composition of natural rubber – occurrence and isolation of natural rubber – draw backs of raw rubber – vulcanization – properties of vulcanized rubber – synthetic – rubber – preparation and applications of SBR rubber, neoprene rubber, butyl rubber and Thiokol.

Distinction between natural rubber and synthetic rubber

ii) Plastics: Introduction – characteristics of plastics – classification of plastics – differences between thermo setting and thermo plastics – preparation and applications of bakelite, Differences between plastics and resins.

iii) Paper: Introduction – raw materials and manufacturing process of paper – types of paper – paper Industry in India.

Unit – V: Textile Industry: (15 hours)

i) Fibres: Definition – characteristics of fibers – types of fibres (natural, semi – synthetic and synthetic fibres) – differences between natural and synthetic fibres – Properties of synthetic fibres – general methods of preparation of synthetic fibres – applications of synthetic fibres.

ii) Manufacture and uses of some important fibers: terylene, viscose, nylon-6, nylon-66, rayon, saran, vinyon, and orlon.

Text Books:

1.B.K Sharma, “ Industrial Chemistry” Tenth Edition, Krishna Prakashan Media (P) Ltd, Meerut, 1999. [U-I: 919-933,893-903,U-II:439-463,379-416,U-III: 486-503,952-970,U-IV:796-878,904-909,U-V: 770-795]

Reference Books:

- 1) Jain and Monika Jain, “ Engineering Chemistry” Fifth Edition, Dhanpat Rai & Sons, Delhi, 1990.
- 2) Chakrabarthy B.N, “ Industrial Chemistry” Oxford & IBH Publishing & Co. Pvt Ltd, New Delhi, 1994.
- 3) M.G Arora & M.Singh “ Industrial Chemistry” Anmol Publications Pvt Ltd, New Delhi, 1999.

Course : III - B.Sc

Semester: V

Practical: III

Title of the Paper: Gravimetric Estimation and Organic preparation

Subject code:

No of hours/week: 5

No of Credits: 5

(At the end of the **SEMESTER FIVE**)

Course Objectives:

1. To make the students to estimate the amount of substance present in the whole of the given solution.
2. To make the students to prepare the organic compounds.

a. Gravimetric Estimation

1. Estimation of lead as lead chromate
2. Estimation of barium as barium chromate
3. Estimation of calcium as calcium oxalate monohydrate
4. Estimation of nickel-DMG complex

II. Organic preparation

1. Preparation of BENZOICACID from BENZAMIDE.
2. Preparation of BENZANILIDE from ANILINE.
3. Preparation of PHENYLBENZOATE from PHENOL.
4. Preparation of 2-NAPHTHYL BENZOATE from 2-NAPHTHOL.
5. Preparation of GLUCOSAZONE from GLUCOSE.
6. Preparation of SALICYLIC ACID from METHYL SALICYLATE (Demo only)

Total Marks = 100 (Internal 40 + External 60)

Internal Marks Distribution:

1. Gravimetric estimation	= 25 marks
2. Preparation of Organic Compound	=15 marks

Total	= 40 marks

1. Marks Distribution for Gravimetric Estimation = 25 marks

Procedure	= 05	Distribution of marks
Estimation	= 20	Estimation (20 marks)
	-----	Error <1% -20 marks
Total	= 25	Error 1-2% -15 marks
	-----	Error 2-3% -10 marks
		Error 3-4% -05 marks
		Error >4% - 03 marks

2. Preparation of Organic compound (15 marks)

Procedure	= 05
Preparation of Organic Compound	= 10

Total	= 15

External Marks Distribution:

Record	= 10 marks
Gravimetric estimation	= 35 marks
Preparation of Organic Compound	= 15 marks
Total	= 60 marks

1. Marks Distribution for Gravimetric Estimation = 35 marks

Procedure	= 10	Distribution of marks Estimation (25 marks) Error <1% -25 marks Error 1-2% -20 marks Error 2-3% -15 marks Error 3-4% -10 marks Error >4% - 05 marks
Estimation	= 25	

Total	= 35	

2. Preparation of Organic compound (15 marks)

Procedure	= 05
Preparation of Compound	= 10

Total	= 15

MAJOR PRACTICAL-IV

Course: III - B.Sc

Subject code:

Semester: V & VI

No of hours/week: 3

Practical: IV

No of Credits:4

Title of the Paper: Organic analysis and Estimation

(At the end of the **THIRD YEAR**)

Course Objectives:

1. To make the students to estimate the amount of substance present in the whole of the given solution.

2. To make the students to analyze the organic compound containing one functional group and confirmation by the preparation of a solid derivative.

a. Organic estimation

i) Estimation of Phenol

ii) Estimation of Aniline

b. Organic Analysis

i) Analysis of an organic compound containing one functional group stating aliphatic or aromatic, saturation or unsaturation, elements present and confirmation by the preparation of a solid derivative.

ii) Acids, phenols, aldehydes, ketones, esters, nitro compounds, amines (primary amines only), amides, diamide, anilides and monosaccharide (glucose only).

Total Marks = 100 (Internal 40 + External 60)

Internal Marks Distribution:

1. Organic analysis	= 25 marks
2. Organic estimation	=15 marks

Total	= 40 marks

1. Marks Distribution for Organic Analysis = 25 marks

Procedure	= 05
Analysis	= 20

Total	= 25

2. Organic Estimation (15 marks)

Procedure	= 05
Organic Estimation	= 10

Total	= 15

Distribution of marks

Estimation (20 marks)

Error <1%	-20 marks
Error 1-2%	-15 marks
Error 2-3%	-10 marks
Error 3-4%	-05 marks
Error >4%	-03 marks

External Marks Distribution:

Record	= 10 marks
Organic analysis	= 25 marks
Organic estimation	= 25 marks
Total	= 60 marks

1. Marks Distribution for Organic analysis = 25 marks

Preliminary reaction	= 02
Elements present	= 05
Aliphatic or aromatic	=02
Saturated/ Unsaturated	=02
Functional group	=10
Derivative	=02
Recrystallization	=02

Total	= 25

2. Marks Distribution for Organic Estimation (25 marks)

Procedure	= 10	Distribution of marks Estimation (25 marks)
Organic Estimation	= 15	

Total	= 25	
	-----	Error <2% -25 marks
		Error 2-3% -23 marks
		Error 3-4% -20 marks
		Error >4% -15 marks

PAPER III

NON-CONVENTIONAL & RENEWABLE SOURCES OF ENERGY

Semester : V

Sub code :

Extra Credit: 3

Course Objectives:

- To have an exposure to the different forms of non-conventional and renewable sources of energy available to meet the present day energy demand.

Unit- I: Introduction

Energy sources and their availability- renewable and non-renewable sources of energy- conventional energy sources- non-conventional sources of energy- population growth and energy use- conservation of energy- energy planning- reasons for the requirement of non-conventional energy sources.

Unit- II: Solar Energy-I

Solar energy- solar radiation at the earth's surface- solar energy collectors- physical principles of the conversion of solar radiation into heat- solar energy collectors-non-concentrating and concentrating collectors.

Unit- III: Solar Energy-II

- i) Solar energy storage- thermal storage- electrical storage- chemical storage- thermochemical energy storage.
- ii) Applications of solar energy- solar water heating- solar cooking - solar thermal electric conversion- solar electric power generation (photo-voltaic cells) -. -agriculture and industrial process of heating.

Unit- IV: Wind Energy & Energy from Ocean:

- i) **Wind Energy:** wind energy conversion- wind energy collector- advantages and disadvantages of wind energy- applications of wind energy.
- ii) **Energy from Oceans:** methods of ocean thermal electric power generation- Claude cycle and Anderson cycles energy from tides-basic principle of tidal power- advantages and disadvantages of tidal power generation- prospects of tidal energy in India; Wave energy- advantages and disadvantages of wave energy.

Unit- V: Geothermal Energy, Energy from biomass & Bio-Fuels

- i) **Geothermal Energy:** Geothermal sources- hydrothermal- geopressure-magma- advantages and disadvantages of geothermal energy- geothermal energy in India.
- ii) **Energy from biomass:** Biomass resources- biomass generation- biogas plant used in India- biomass gasification.
- iii) **Bio fuels:** Ethanol to substitute petrol- fuel from sorghum- petrocrops an alternative to future fuels.

Reference Books:

1. G.D. Rai, "Non-Conventional Energy Sources", Second Edition, Kanna Publications. 1992.
2. B.K. Sharma, "Environmental Chemistry" Goel Publishing House, Meerut;1996-97
3. Extracts from internet.

Semester : VI

Subject code:

Hours/week : 3

Total Hours/Semester: 45

Credit : 3

Objectives:

- 1) To acquire knowledge related to molecular rearrangements, tautomerism, heterocyclic compounds, and carbohydrates.
- 2) To understand the concept of molecular spectroscopy, chromatography and mass spectrometry.

Unit-I: Molecular rearrangements and Tautomerism (9 hours)

i) Molecular Rearrangements: Detailed mechanisms of the following rearrangements: pinacol-pinacolone, Hofmann, Claisen, benzidine, Beckmann and Fries rearrangements.

ii) Tautomerism: Definition-classification of tautomerism-prototropy and anionotropy-

. A detailed study of i) keto-enol tautomerism

ii) nitro-acinitro tautomerism

iii) nitroso-isonitroso tautomerism

iv) lactam-lactim tautomerism

Differences between tautomerism and resonance-differences between tautomerism and isomerism.

Unit-II Heterocyclic Compounds (9 hours)

i) Preparation, synthesis and properties of pyrrole, furan, thiophene and pyridine

ii) Preparation, synthesis and reactions of oxazole, pyrazole, indole, quinoline, Isoquinoline.

Unit-III: Carbohydrates

(9 hours)

- i) **Monosaccharides:** Definition and classification-detailed study of monosaccharide-glucose and fructose-mutarotation-epimerisation-structure and configuration of glucose and fructose-comparison between glucose and fructose-methods of ascending and descending in the sugar series-interconversion between glucose and fructose.
- ii) **Disaccharides:** Introduction - structure of sucrose - preparation, properties and structure elucidation.
- iii) **Poly saccharides:**
 - a) Preparation , properties structure and uses of starch.
 - b) Preparation , properties structure and uses of cellulose.

Unit-IV Molecular Spectroscopy (9 hours)

- i) **Ultra violet-visible spectroscopy (Electronic Spectroscopy):** Introduction-Franck Condon principle (Electronic transition)-types of transition in organic molecules ($n-\pi^*$, $\sigma-\sigma^*$, $n-\sigma^*$, $\pi-\pi^*$)-basic concepts-batho chromic shift, hypso chromic shift, hyper chromic shift, hypo chromic shift, auxo chrome chromophore, effect of conjugation, Woodward Fieser rules for calculating λ_{\max} value-(conjugated dienes, α,β unsaturated carbonyl compounds)
- ii) **NMR Spectroscopy:** Introduction-rules (predicting the nuclear spin)- chemical shift, factors influencing chemical shift, shielding and deshielding of protons, spin-spin coupling (NMR spectrum of acidified and pure ethanol), coupling constant-rules for calculating the number of lines in NMR spectra (Pascal's triangle)-NMR spectra of ethane, propane, toluene, nitrobenzene, acetone, ethylene, paraxylene.

Unit-V Chromatography and mass spectrometry (9 Hours)

- i) **Chromatography:** Definition-principles of chromatography-types of chromatography-experimental technique and applications, thin-layer chromatography, paper chromatography and high performance liquid chromatography (HPLC) - paper electrophoresis - R_f values and factors affecting R_f values.
- ii) **Mass Spectrometry:**
 - i) Basic principles-Aston mass spectrometer-resolution of mass spectrometer.

ii) Mass spectrum-types of ions produced in a mass spectrometer-parent ions-rearrangement ions-isotope ions- base peak – molecular ion peak – meta stable peak – fragmentation (simple cleavage, Retro-Diels Alder reaction, Mc-Lafferty rearrangement, Nitrogen rule)-applications of mass spectrometry (Fragmentation patterns of organic compounds-alkanes, alkenes, alcohols, aldehydes, ketones and amines).

Text Books:

1. Bhupinder Mehta&Mnju Mehta, “ Organic Chemistry”, PHI Learning PVT, New Delhi-2008. **[Unit I:]**
2. P.L.Soni, H.M.Chawla, “Text Book of Organic Chemistry”, Sultan Chand & Sons. New Delhi-1990. **[U-II:3.44-3.75,U-III:3.93-3.141,U-IV:1.238-1.323,U-V: 1.14-1.24]**
- 3.Y.R Sharma, “Elementary Organic Spectroscopy”, S.Chand & Co. New Delhi. **[U-IV:208-230-,U-V: 234-304]**
4. Gurdeep Chatwal, Sham Anand,” Spectroscopy (atomic and molecular),” Himalaya Publishing House, Mumbai-20014. **[U-IV:2.149-2.231-,U-V: 2.272-2.302]**

Reference Books:

1. K.S.Tewari, S.N.Mehrotra, N.K.Vishnoi, “A Text Book of Organic Chemistry” Vikas Publishing House Pvt Ltd, New Delhi-1987
2. I.L.Finar, “Organic Chemistry”, Vol-I, Pearson Education-2003

PAPER-IX
PHYSICAL CHEMISTRY-II

Semester : VI

Subject code:

Hours/week: 4

Total Hours/Semester: 60

Credit : 4

Objectives:

This course covers the Photochemistry, Ionic Equilibria, Electrochemistry and Molecular Spectroscopy.

Unit-I: Photochemistry (12 hours)

a) Photo Chemical Reaction: Definition – comparative study of photochemical and thermal reactions - laws of photochemistry – Lambert and Beer’s law – Grothus-Draper law - Stark-Einstein’s law - quantum efficiency and its determination - consequence of light absorption by atoms and molecules – photo physical processes - fluorescence and phosphorescence and other deactivating processes - Jablonski diagram.

b) Photo Chemical Processes: Kinetics of photochemical reaction

(i) Gaseous reactions: Hydrogen-Halogen reactions (formation of HCl and HBr)

ii) Photo Chemical equilibrium - Photosensitization, chemiluminescence – bioluminescence.

Unit-II: Ionic Equilibria (12 hours)

(i) Ostwald’s dilution law and it’s derivation. Strength of acids and bases based on their dissociation constant problems based on Ostwald’s dilution law.

(ii) Arrhenius, Bronsted-Lowry and Lewis concept of acids and bases-Multistage Ionization of acids and bases with examples.

(iii) Ionic product of water-PH of solutions and PH Indicators-,pOH, pK_w of solutions; Numericals on the above concepts-PH indicators and their choice in titrimetry.

(iv) Common ion effect-definition, examples (acetic and Sodium acetate; ammonium hydroxide and ammonium chloride)-application in salt analysis.

(v) Salt hydrolysis-salts of strong acid and weak bases, weak acids and strong bases, weak Acids and weak bases and the derivation of PH of solutions of these salts in water with

Suitable examples (in detail)-Numericals.

- (vi) Buffer solutions : Definition, examples, action-its interpretations based on LeChatelier's Principle-Henderson's equation-Numericals.
- (vii) Solubility product and its applications; Solubility product-Definition and application
In qualitative salt analysis (group II, III and IV cations)-Numerical on solubility product.

Unit-III Electrochemistry-I (12 hours)

- (i) Faraday's laws of electrolysis-Coulometer faraday's law of electrolysis-Statement-Mathematical form-Simple problems. Faraday's IInd law of electrolysis-Statement-Mathematical form-Siimple problems.
- (ii) Relation between Faraday-Avogadro's number and charge on an electron. $F=NAe$
Should be given (no details of Mullikan's experiment required).
- (iii) Galvanic cells, mechanism of current production in a galvanic cell-and electrode Potential, standard hydrogen electrode-electrochemical series-Nernst equation.
- (iv) Galvanic cells-introduction-representation-principle-oxidation reduction
Mechanism of production of electric current in a galvanic cell-Measurement of Potential-Single electrode potentials-Electrical doube layer-Standard hydrogen Electrode-definition, preparation, application and limitations.
- (v) Standard electrode potential Measurements of standard electrode potential-Measurements of Standard electrode potential if Zn^{++}/Zn^0 half cell (using standard Hydrogen electrode)
- (vi) Idea of heterogeneous equilibria on the surface of electrode. Cell notation
- (vii) Factors affecting electrode potential
Factors affecting electrode with explanation – main emphasis on the temperature and Concentration and nature of electrode.
- (viii) Electrochemical series and its explanation on the basis of Standard electrode Potential. Prediction of the feasibility of a reaction.
- (ix) Numerical based on calculation of emf of a cell form the values of Standard electrode Potential.
- (x) Nernst equation (correlation with the free energy of the reaction)

- Nernst equation with suitable examples.
- Prediction of spontaneity of a reaction based on the cell emf
- Numericals on cell emf and Standard electrode potential of the half-cells.

Unit-IV Electrochemistry-II (12 hours)

- i) Electrolytic conductance:** specific conductance – Measuring of molar and equivalent Conductance – Kohlrausch's law-comparison of metallic conductance and electrolytic conductance – relationship between conductance and resistance – specific resistance and specific conductance – cell constant – calculation of cell constant – meaning of equivalent conductance –meaning of molar conductance – general relationship between specific conductance, molar and equivalent conductance – units numerical – graph – molar conductance of a weak electrolyte at a given concentration and at infinite dilution - Kohlrausch's law - definition and numerical.
- ii) Corrosion concept:** Mechanism of electrochemical reaction – factors affecting and its prevention.
- iii) Batteries:** Primary and secondary cells – lead storage battery and fuel cell – structure, reactions and uses.

Unit-V Molecular Spectroscopy (12 hours)

- i) Introduction-characterization of electromagnetic radiation (wavelength, wave number)-regions of the spectrum.**
- ii) Rotational spectra of diatomic molecules:** Rigid rotator- selection rule –determination of moment of inertia and bond length.
- iii) Vibrational-rotational spectroscopy (Infra-red spectroscopy):** Introduction-derivation of force constant of diatomic molecule-vibrational energy levels-selection rules-modes of vibration of atoms in poly atomic molecules-CO₂, H₂O (stretching and bending vibration)-applications,detection of functional group (OH, COOH, NH₂, NO₂, CO),study of hydrogen bonding and finger print region.
- iv) Raman spectroscopy:** Introduction-types of scattering-stokes lines-anti stokes lines-quantum theory of Raman effect-selection rules-advantages of Raman spectroscopy over IR spectroscopy-rule of mutual exclusion-applications (structure of CO₂, H₂O, N₂O)

Text Books:

1. Gurdeep Raj, "Advanced Physical Chemistry", Goel Publishing House, Delhi, 32 edition 2006. [U-I: 785-840,U-II,III&IV:1107-1280]
2. Puri, Sharma, Pathania,"Principles of Physical Chemistry," Vishal Publishing Co, Jalandhar-2004. [U-I: 1043-1076,U-II: 654-696,U-III:748-778,U-IV:782-891]
3. Colin,N.Banwell and Elaine M.McCash,"Fundamentals of molecular spectroscopy," Tata McGraw-Hill Publishing Company Limited, New Delhi-1996. [U-V: 1-30,55-126]

Reference Books:

1. K.K. Rohatgi-Mukherjee, "Fundamentals of Photochemistry", Willey Eastern Ltd., New York-1994. [U-I: 126-268]
2. Gurdeep Chatwal, Sham Anand," Spectroscopy (atomic and molecular)," Himalaya Publishing House, Mumbai-20014. [U-V: 2.27-2.105]

PAPER - X
COMPUTER IN CHEMISTRY

Semester : VI

Subject code:

Hours/week: 3

Total Hours/Semester: 45

Credit : 3

Objectives :

To acquire knowledge related fundamentals of computers basic programming applications in organic chemistry and C programming in Inorganic chemistry.

Unit –I: Fundamentals of Computer (9 Hours)

Introduction – What is a computer? – computer versus calculator – advantages and disadvantages of computers – computer system organization – representation of numbers – storage of data – history of computers – computer generation – classification of computers – the operating system – DOS commands – windows – computer viruses – worm – bug – program debugging or error finding.

Unit –II: Chemistry and Basic Programming (9 Hours)

Introduction - the input statement – the read statement and library functions – the IF-THEN statement – use of two IF-THEN statements – using the IF-THEN statement for doing respective calculations – the IF-THEN-ELSE statement - the IF-THEN-ELSE statement with the logical operator ‘AND’ - the IF-THEN-ELSE statement with the logical operator ‘OR’.

Unit- III: Basic Programming Applications in Organic Chemistry (9 Hours)

Introduction – (i) determination of empirical formulae of hydrocarbons and other organic compounds – (ii) program to determine molecular weights of organic compounds – (iii) calculation of delocalization energy values for aromatic systems - (iv) determination of percentages of elements in an organic compound.

Unit –IV: C-Programming and Chemistry (9 hours)

Introduction – character set in c – style of C language – C keywords – variables in C – constants in C – operators in C – input and output in C language – control statements in C – storage classes in C functions in C – arrays and pointers – writing a C-Program using the various features of C language.

Unit –V: C-Programming Applications in Inorganic Chemistry (9 Hours)

Introduction – (i) determination of electronegativity of an atom from bond energy data using Pauling's relation – (ii) determination of lattice energy of a crystal using Born-Landé equation – (iii) shapes of molecules or ions using VSEPR theory – (iv) applications in crystallography – (v) applications in group theory.

Text Books:

1. K. V.Raman, "Computers in Chemistry", Tata McGraw-Hill Publishing Co, 1996. [U-II: 76-88, U-III: 419-428, U-IV: 220-312, U-V: 325, 342-387]
2. Ramesh Kumari, "Computers and their applications to Chemistry", Narosa Publishing House Pvt.Ltd. 2005. . [U-I: 1-35]

Reference Books:

1. E. Balagurusamy, "programming in ANSI C – Third Edition – Tata Mc Graw – Hill publishing Co- 2004.

MAJOR ELECTIVE-III
GREEN AND NANO CHEMISTRY

Semester : VI

Subject code:

Hours/week : 5

Total Hours/Semester: 75

Credit :5

Objectives:

This course enables the students to acquire a basic knowledge of Green Chemistry and Nano chemistry. An in-depth study of synthesis of nanomaterials is also dealt.

Unit-I: Green Chemistry-I (15 hours)

Need for Green chemistry-Goals of Green chemistry-Limitations/Obstacles-The progress of Green chemistry-Twelve principles of Green chemistry-Concept of Atom economy (Rearrangement reactions, Addition reactions, Substitution reactions and Elimination reactions)-Concept of selectivity (Chemo selectivity, Regioselectivity, Enantioselectivity and Diastereoselectivity)

Unit-II: Green Chemistry-II (15 hours)

Green solvents (Supercritical carbon dioxide, Ionic liquids, water and organic synthesis in solid state) -Mode of supplying energy to a reaction (Use of microwaves and Use of sonication)-Basic concepts in designing a Green synthesis (Choice of starting materials, reagents, catalysts and solvents) Synthesis of Adipic acid, Catechol, BHT, Methyl methacrylate, Urethane, Benzyl bromide, Acetaldehyde, Citral, 4-aminophenylamine and Paracetamol.

Unit-III: Green Chemistry -III (15 hours)

Microwave assisted reactions in water (Hofmann elimination, Hydrolysis of benzyl chloride, Hydrolysis of Benz amide, Hydrolysis of methyl benzoate, Oxidation of toluene and Oxidation of alcohols) - Microwave assisted reactions in Organic solvents (Esterification, Fries rearrangement, Orthoester Claisen rearrangement, Diels Alder reaction and Decarboxylation)-Microwave assisted solvent-free reactions (Deportation, Saponification, Alkylation of reactive methylene compounds, Synthesis of nitriles from aldehydes, Synthesis of anhydrides from dicarboxylic acids, Synthesis of pyridines and Synthesis of Benzimidazoles)-Ultrasound assisted

reactions (Esterification, Saponification, Substitution reactions, Alkylation, Oxidations, Reductions and Coupling reactions)-Future trends in Green Chemistry.

Unit-IV: Nano Chemistry -I (15 hours)

Characterisation of Nanomaterials-Stability of Colloidal solutions-Synthesis of metal Nanoparticles top-down, bottom up approach - physical methods (Laser Ablation, Physical Vapour Deposition (Evaporation and Sputtering) and Solvated Metal Atom Dispersion)-Synthesis by chemical methods (Thermolysis, Sonochemical Approach, Reduction by hydrogen, Reduction by methanol, Borohydride reduction and Alkali metal reductions)-Biosynthesis of Nanoparticles.

Unit-V: Nano Chemistry -II (15 hours)

Synthesis of Nanosized semiconductors (Precipitation methods and Thermal decomposition of complex precursors)-Synthesis of ceramics by physical methods (Gas condensation method and Laser method) and chemical method (Sol-Gel synthesis)-Preparation of Nitrides and Carbides-Properties of Nanostructure materials (Size effects, Optical and electronic properties, magnetic properties)-Application of nanomaterials.

Text books:

1. V.Kumar, "An Introduction to Green Chemistry", First Edition, Vishal Publishing Co, New Delhi-2007. [U-I-III: 1-79]
2. M.H.Shah, Tokeer Ahmad," Principles of Nano Science and Nano Technology', Navosa Publishing House, New Delhi.2011. [U-IV: 1-65,U-V: 155-185]
3. F.J.Ownes, "Introduction to Nanotechnology", Academic Press, Santiago, 2000.

Reference books:

1. Kenneth, J.Klabunde, "Nanoscale Materials in Chemistry", Wiley Interscience, 2001.
2. R.Sanghi, M.M. Srivastava, "Green Chemistry", Narosa Publishing House, New Delhi-2003.
3. V.K.Ahulwalia, M.Kidwai, "New Trends in Green Chemistry", Second Edition, Anamaya Publishers, New Delhi- 2004.

MAJOR PRACTICAL-V

Course: III - B.Sc

Semester: VI

Practical: V

Title of the Paper: Physical Chemistry

Subject code:

No of hours/week: 5

No of Credits: 5

(At the end of the **SEMESTER SIX**)

Physical Chemistry Experiments

1. Determination of molecular weights by

- a) Transition temperature method: sodium thiosulphate penta hydrate
- b) Cryoscopic method: Rast's macro method- naphthalene

2. Phase diagram involving

Simple eutectic

3. Critical solution temperature:

Determination of CST of phenol-water system and effect of impurity on CST- strength of sodium chloride.

4. Thermo chemistry:

Heat of solution- Ammonium oxalate- water system.

5. Viscosity:

Determination of the composition of an unknown mixture.

6. Conductometric Titration:

Conductivity titration between an acid and a base (**HCl vs NaOH**)

7. Potentiometric Titration:

- i) Titration between ferrous ammonium sulphate and potassium permanganate
- ii) Titration between ferrous ammonium sulphate and potassium dichromate



Total Marks = 100 (Internal 40 + External 60)

Internal Marks Distribution:

For completion of the experiment	= 10
Graph	= 05
Calculation	=10
Tabulation	=05
Result	=10

Total	= 40

External Marks Distribution:

Record	= 10
For completion of the experiment	= 20
Graph	= 05
Calculation	=10
Tabulation	=05
Result	=10

Total	= 60

SELF-STUDY
PAPER IV
MEDICINAL CHEMISTRY

Semester: VI

Sub code:

Extra Credit: 3

Course Objective:

- To acquire basic knowledge in the field of Medicinal Chemistry.
- To understand the drugs for various diseases and their mode of action.

Unit- I: Terminology and classification of drugs:

- iii) **Drug**: Definition – requirements of drugs – history of drugs.
- iv) **Terminology** in Drug Chemistry: Medicinal Chemistry – pharmacy – pharmacology – pharmacodynamics – pharmacophore – antimetabolite – bacteria – virus and fungi.
- v) **Classification of drugs**: On the basis of their therapeutic action.

Unit -II : Anesthetics, Analgesics and Antipyretics:

- i) **Anesthetics**: Definition – characteristics – classification – applications of nitrous oxide, chloroform and cocaine
- ii) **Analgesics**: Definition – mode of action – specific applications of antipyrine, aspirin and novalgin.
- iii) **Antipyretics**: Definition – mode of action – medicinal uses of salol and para-acetamol.

Unit -III: Sulpha drugs, Antibiotics and Antiseptics:

- i) **Sulpha drugs**: Definition – mode of actions of sulphanilamide, sulphapyridine and sulphadiazine.
- ii) **Antibiotics**: Definition – characteristics – mode of action –uses of penicillins, streptomycin, chloramphenicol, erythromycin and tetracyclins
- iii) **Antiseptics** : Definition- types of antiseptics – difference between antiseptic and disinfectant.

Unit -IV: Hypnotics, Sedatives and Tranquilizers:

- i) Hypnotics and Sedatives: definition-types(alcohols-aldehydes, ketones and sulpones-urethans- amides and urea –barbiturates)-applications of chloral,paraldehyde,sulponal and barbituric acid.
- ii) Tranquilizer: Definition – characteristics- classification – applications of piperadol and hydroxyzine.

Unit -V: Antineoplastic Agents

- i) Cancer: introduction – causes for cancer(poly – cyclic aromatics, nitro aromatics, chloroethylene and halogenated olefins)-treatment (Radiation, Chemotherapy, Surgical treatment)- cancer- Chemotherapy- mustards-antimetabolites-hormones.
- ii) Aids and HIV: introduction- transmission and treatment of HIV –prevention of HIV.

Text book:

- 1.G. R.Chatwal, “ Pharmaceutical Chemistry”- ORGANIC vol-II, Second Edition, reprint-2008. [U-I: 20-68,U-II: 109-114,U-III:359-390,U-IV:115-130,U-V:280-295,320-325]

Reference Books

1. Gurdeep R.Chatwal, “ Synthetic Organic Chemistry”,Himalaya Publishing house,Ramdoot-2001.
2. K.Bagavathi Sundari,” applied chemistry”, MJP Publishers, Chennai-2006.
3. Ashotosh Kar,”Medicinal Chemistry”, Thirt Edition, New Age International(P) Limited, New DeLHI-2006.
4. Dr.Bhalerao Marry, Giragon,”Pharmaceutial Chemistry”, Himalaya Publishing House, Ramdoot-2001.

CERTIFICATE COURSE
ANALYTICAL CHEMISTRY
DEPARTMENT OF CHEMISTRY
YADAVA COLLEGE, MADURAI-14
PAPER-I: INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS

Semester : VI

Total hours/ Semester: 45

Subject Code:

Objectives:

1. To prepare the student to acquire specialization in Analytical Chemistry
2. To enable the students to get employed as Analytical Chemist in industrial laboratories.
3. To learn the basics of Column Chromatography Analysis.
4. To know about the Spectrophotometric determination of Nickel Using Dimethylglyoxime and identification of Organic compounds using UV- visible Spectrophotometer.
5. To know about the determination of Physico Chemical parameters of Water and Waste water analysis.
6. To get an insight into modern experimental techniques in the field of Analytical Chemistry and error analysis.

Unit- I: Analytical Chemistry and Role of Analytical Chemistry (9 Hours)

i) Analytical chemistry: Introduction-Qualitative Analysis-Quantitative Analysis-Phase Analysis .

ii) Role of analytical chemistry: Clinical Tests-Quality Control of Drugs-Role in Industry-Environmental Quality-Food Analysis-High Purity Materials-Miscellaneous Applications.

Unit –II: Classification of Analytical Methods (9 hours)

Classical or Chemical Methods -Gravimetric Method- Gas Analysis- Advantages of Classical Methods-Limitations or Disadvantages of Classical methods – Instrumental or Physicochemical

methods of Analysis- Advantages of Instrumental methods- Limitations of instrumental methods- differences between Classical and Instrumental methods.

Unit-IV: Instrumental Analysis and Column Chromatography (9 hours)

a) Types of Instrumental Analysis: Electrochemical methods- Basic concepts of (Electrogravimetry-Coulometry-Potentiometry- Conductometry-Polarography) Basic concepts of Optical methods- (Emission spectroscopy-luminescence analysis- X-ray spectroscopy- Raman spectroscopy- Atomic Absorption spectrophotometry-Turbidimetry- Mass spectrometry- Nuclear magnetic resonance- Nephelometry- Refractometry) Radiometric Methods – (Isotopic Dilution)

b) Sensitivity and Detection limits- Selection of an Analytical method- Comparison of some common Quantitative Analytical methods.

C) Chromatography Analysis –

(i) Basic principles of GC and HPLC.

(ii) Extraction of pigments from Spinach – Identification of pigments by Thin Layer Chromatography and Column Chromatography.

(iiI) Separation of mixture of o-nitro phenol and p-nitro phenol, separation of β -carotene from Carrot extract by Column Chromatography.

Unit –IV: Spectrophotometer,UV-Visible spectrophotometer and Water analysis

(9 Hours)

i) Basic concept of Beer-lambert's law.

ii) Spectrophotometric determination of Nickel using Dimethylglyoxime.

iii) Identification of Organic compounds using UV-Visible Spectrophotometer(o-nitro phenol, p-nitro phenol and β -carotene).

iv) Water and Waste Water Analysis (Determination of Physico-Chemical parameters in Water and Waste Water Analysis).

Unit-V: Error Analysis

(9 hours)

Definitions-Terms absolute error and relative error-Precision and accuracy- Classification of errors-Confidence limit-Students – T-test - Q-test- F-test - Rejection of experimental data- Sources and eliminations of errors-Significant figures and computation.

Text books:

1. Jain and Jain, "Engineering Chemistry," Dhanpat Rai & Publishing , 2008.
2. R. Gopalan, P. S. Subramanian, K. Rengarajan", Elements of Analytical Chemistry," Sultan Chand & Sons 2005.
3. S. Usha Rani, "Analytical Chemistry," Maxmillan India Ltd, New Delhi 2008.
4. K. S. Tewari, S. N. Mehrotra, N. K. Vishnoi," A Text Book of Organic Chemistry", Vikas Publishing 1979.
5. Gurdeep R. Chatwal," Analytical Chemistry," Himalaya Publishing House-2008.

Reference Books:

- 1 Dr. P. Asokan," Analytical Biochemistry," Chinnaa Publications-2006.
- 2 K.B. Baliga,S. M. Shetty,S. A. Zaveri, A. P. Taggarse,"College Analytical Chemistry," Himalaya Publishing House-1997.
- 3 S. M. Khopkar," Basic Concepts of Analytical Chemistry", Wiley Estern Limited - 1984.
- 4 U. N. Dash," Analytical Chemistry Theory and practice," Sultan Chand & Sons - 2005.
- 5 Gurdeep R. Chatwal, Sham K. Anand, "Instrumental Methods of Chemical Analysis", Himalaya Publishing House - 2006.

DEPARTMENT OF CHEMISTRY
YADAVA COLLEGE, MADURAI-14
PAPER-II: CLINICAL CHEMICAL ANALYSIS

Semester : VI

Total hours/ Semester: 45

Subject Code:

Course Objective:

- i) To acquire basic knowledge in the field of Clinical Chemistry**
- ii) To understand the clinical importance of some common bio chemical parameters and normal values in blood and urine.**
- iii) To identify the bio chemical parameters in blood and urine by qualitative analysis.**

Unit –I: Blood Components (9 Hours)

Functions of blood - Clinical importance of some common bio chemical parameters and normal values in blood - blood components – Blood plasma and cellular elements - Blood Gas Instrumentation.

Unit –II: Collection and Preservation of Blood Samples (9 Hours)

Collection– Venous blood, arterial blood, anticoagulants – collection of blood samples (collection of blood for analysis CO₂, glucose, serum, plasma) – Collection of blood of an HIV infected patient - storage and preservation of blood samples.

Unit –III: Blood Analysis (Demonstration only) (9 Hours)

- a. Blood Sugar - Folin Wu method, Blood Urea - Urease method, Blood Cholesterol - Zak's method, Serum inorganic phosphate by Fiske-Subbarow method, Serum calcium by titrimetric method and Serum protein(albumin:globulin ratio by colorimetric method).
- b. Blood group and Rh factor.

Unit –IV: Urine Analysis -I: (9 Hours)

Analysis of Normal Urine – some common constituents in urine and normal value- physical characteristics – chemical characteristics – inorganic constituents (test for chloride, sulphate, calcium, phosphate, ammonia) – organic constituents ((i)tests for urea –sodium hypobromite test, specific urease test, (ii) test for uric acid – Schiff test, phosphotungstic acid reduction test (iii) test for creatinine – jaffe's test.

Unit –V: Urine Analysis -II:

(9 Hours)

Analysis of Abnormal Urine – physical characteristics in pathological conditions (volume, colour, P^H, specific gravity) – chemical constituents (test for albumin -- acetic acid test, glucose – benedict’s test, ketone bodies – Gerhardt’s test, bile salts – Hay’s test, bilirubin – fouchet’s test, blood(presence of RBC in urine) – benzidine test.

References:

1. T.N. Pattabiraman, “Laboratory manual in Biochemistry”, Third edition 1998, All India Publishers & Distributors , Chennai. I.S.B.N. 8185502 - 42 – 0.
2. Gurdeep R. Chatwal , “Analytical Chemistry”, Frist edition: 2008, Himalaya Publishing House.
3. HiPer Blood Grouping Teaching Kit, HiMediaLaboratories PVT. Limited.

ALLIEDCHEMISTRY
SYLLABUS

For Both

B.Sc., BIOCHEMISTRY

&

B.Sc., MICROBIOLOGY

2018

PAPER – I
GENERAL CHEMISTRY

Subject Code: P3ACH1

Semester: I

Hours per week: 5hrs

Total hrs per semester: 75hrs

This paper is intended to impart basic knowledge of chemistry. It includes the topics Atomic structure, Gaseous state, Acids & Bases, Chemical bonding, Nuclear chemistry & radioactivity.

UNIT I

ATOMIC STRUCTURE

Dalton's atomic theory – Atomic number – Mass number – Electronic configuration - Bohr's atomic model – Rutherford nuclear atomic model - Photoelectric effect – Quantum numbers – Shapes of orbitals –Bohr-bury rules – Aufbau principle – Pauli's exclusion principle – Hund's rule of maximum multiplicity.

UNIT – II

GASEOUS STATE

Gas laws – Ideal gas law or the Gas equation – Avogadro's number (definition)– Kinetic theory of gases - Distribution of molecular velocities: Average velocity – Most probable velocity and Root mean square velocity of gaseous molecules – Kinetic equation of gases (derivation) - Derivation of gas laws from Kinetic gas equation — van der Waal's equation (derivation).

UNIT – III

CONCEPTS OF ACIDS & BASES

Arrhenious theory – Lowry &Bronsted concept – Lewis concept – Common ion effect – Ionisation of weak acids and bases – Ostwald's dilution law – Buffer solution – types of buffers – buffer action –buffers in biological systems – Indicators – theory of indicators.

UNIT – IV

CHEMICAL BONDING

Types of bond – Octet Rule – Ionic Covalent – Coordinate covalent bond –

vander Waal's forces – Hydrogen bonding: definition – types - applications – Overlapping of atomic orbitals – Hybridisation – sp , sp^2 , sp^3 – Valence bond theory – Molecular orbital theory – MO diagram for simple diatomic molecules N_2 , F_2 , O_2 - VSEPR theory – application to specific molecules NH_3 & H_2O .

UNIT – V

NUCLEAR CHEMISTRY AND RADIOACTIVITY.

Nuclear fission – Atom bomb – Nuclear fusion – Hydrogen bomb – Nuclear reactions – Radio activity – radioactive rays - theory of radio activity – radioactive disintegration - Half-life period - Isotopes - separation of isotopes: diffusion method – application of Radio isotopes in medicine, industry, and agriculture.

TEXT BOOKS

1. Puri. B.R, Sharma.L.R, Pathania. S, Principles of Physical Chemistry, 41st Edition (2004), ShobanLal, Nagin Chand & Co. Jalandhar.
2. Madan. R.D, Modern Inorganic Chemistry, 2nd Edition (2004), S. Chand & Company Ltd., New Delhi.

REFERENCE BOOKS

1. Negi. A.S, Anand. S.C, A Textbook of Physical chemistry, Third Reprint (1994), Wiley. Eastern Ltd., New Delhi.
2. Soni. P.L, Dharmarha. O.P., Dash U.N, Textbook of Physical Chemistry, 22nd Edition (2001), Sultan Chand & Sons, New Delhi.
3. Soni. P.L, Text book of Inorganic Chemistry, 20th Edition (1997), Sultan Chand & Sons. New Delhi.
4. Sharma. K.K, Sharma. L.K, Text book of Physical Chemistry, 4th Revised edition, Vikas Publishing House Pvt. Ltd.
5. Wahid U.Malik, Tuli. G.W, Madan. R.D, Selected topics in Inorganic Chemistry, 7th edition (2002), S.Chand & Company Ltd., New Delhi.

PAPER – II
ORGANIC CHEMISTRY

SUBJECT CODE:

SEMESTER : II

HOURS PER WEEK:3 HRS

TOTAL HRS PER SEMESTER: 45

This paper includes the topics Classification, Nomenclature, Isomerism and Purification of organic compounds, Heterocyclic Compounds, and Alkaloids and Terpenoids.

UNIT – I

Classification and Nomenclature of Organic Compounds

- a. Classification – Functional groups – Homologous series – Calculation of empirical and molecular formula.
- b. Naming of Aliphatic and Aromatic compounds: Common and IUPAC naming of aliphatic and aromatic alkanes, alkenes, alkynes, alkyl halides, alcohols, aldehydes, ketones, carboxylic acids, ethers, amines and nitro compounds.

UNIT –II

Isomerism:

- a. **Structural isomerism** : Chain, Position, Functional, Metamerism and Tautomerism (definitions and examples)

- b. **Stereo isomerism:**

Optical isomerism – Asymmetric carbon atom – Enantiomers

–Diastereomers – Optical isomerism of Lactic acid and Tartaric acid

– Racemisation (Treatment with chemical reagents). – Resolution of

racemic mixtures: (Biochemical separation, By means of salt formation and Selective adsorption).

Geometrical isomerism: Definition - Cis-Trans isomerism of Maleic and Fumaric acid .

UNIT –III

PURIFICATION OF ORGANIC COMPOUNDS:

Crystallization - Sublimation- Distillation- Steam distillation- chromatography: column chromatography – Thin layer chromatography – Gas chromatography (General methods only).

UNIT –IV

HETEROCYCLIC COMPOUNDS:

Introduction – preparation and reactions of pyrrole, furan, thiophene, pyridine, quinoline and isoquinoline.

UNIT –V

ALKALOIDS AND TERPENOIDS:

Alkaloids:

Definition – occurrence – classification – general extraction and general properties of alkaloids – structure and physiological functions of the following alkaloids: Nicotine – Atropine – Morphine – Coniine – Piperine.

(Structural elucidation not necessary)

Terpenoids:

Classification – Isoprene rule – structure and biological uses of the following terpenoids:-Citral – Geraniol – Menthol – Camphor – α – pinene.

(Structural elucidation not necessary)

TEXT BOOKS:

1. ArunBahl&Bahl B.S, Text book of Organic Chemistry,
1st Edition (2006), S. Chand & Company Ltd, New Delhi..

REFERENCE BOOKS:

1. Soni P.L, Chawla H.M, Text book of Organic Chemistry, 23rd Edition
(1990), Sundan and . Chand & Sons New Delhi.
- 2.Nasipuri D, Stereo chemistry of Organic Compounds, 1st reprint
1992, Wiley Eastern Ltd., New Delhi.
3. Morrison R.T, Boyd. R.N, Organic Chemistry, 6th Edition 2003,
Prentice – Hall of India P.(Ltd).

PRACTICAL I

Second Semester
Max Marks : 100

Time : 2 hrs
Code : Q3ACHL1

VOLUMETRIC ANALYSIS

A double titration involving making up of the solutions to be estimated.

Estimation of sodium hydroxide/ sodium carbonate.

Estimation of oxalic acid.

Estimation of potassium permanganate.

Estimation of ferrous ammonium sulphate/ferrous sulphate.

Estimation of sodium thiosulphate.

Estimation of potassium dichromate.

PAPER - III
INDUSTRIAL CHEMISTRY

Semester: III
Hours / week: 3

Subject code: R3ACH3
Total Hours Per semester: 45

This paper mainly deals with the role of chemistry in the service of Man. It includes the topics insecticides, fertilizers, chemotherapy, polymers, soaps, detergents.

UNIT- I

WATER:

Introduction – Treatment of water for municipal purposes – Chemical methods of sterilization – Physical methods of sterilization – Sea water as a source of drinking water – Hard and soft water – Types of Hardness – Softening of water – Softening of water – permutit of zeolite process.

UNIT - II

CHEMOTHERAPY:

Introduction - Sulpha drugs – Sulphanilamide – Sulpha pyridine – Sulpha guanidine – Antipyretics and Analgesics – Aspirin – Paracetamol – Melubrin – Novalgin – Antimalarial drugs – Quinine and Proguanil (Structure only) – Anaesthetics – procaine and Dimethisquin (Structure only).

UNIT – III

SOAPS AND DETERGENTS:-

Soaps: Definition - Hard and soft soaps – Manufacture – Hot process cleaning action of soap.

Detergents: Introduction – Synthetic detergents – Classification – Biodegradability- methods of preparation (Alfol process only).

UNIT – IV

NATURAL AND SYNTHETIC POLYMER:

Definition- Classification of polymers: Addition polymers and condensation Polymers - Thermoplastics: Polyethylene – Polypropylene – PVC – Teflon – polystyrene - Thermosetting plastics: Bakelite and polyurethane - Rubber – Refining of Crude rubber – Vulcanization of rubber - Synthetic Rubber: Neoprene-Thiokol-Buna Rubbers.

UNIT – V

FERTILIZERS AND INSECTICIDES:

Fertilizers: – Classification – Natural organic Fertilizers – Plant matter – Farm yard – Manures – Animal matter – Artificial fertilizers – Nitrogenous fertilizers – Ammonium sulphate and Ammonium nitrate - Phosphate fertilizers – Ammonium Phosphate.

Insecticides: – Natural of plant insecticides – Nicotine – Pyrethrenes – Rotinone – Organic insecticides. DDT – Methoxychlor – BHC – Aldrin and Dieldrin

Text Books:

1. Sharma . B.K, Industrial chemistry , 5th Revised edition, Goel publishing House.
2. Chakrabarty. B.N, Industrial chemistry, 6th Edition, Oxford IBH publishing company pvt.Ltd.

Reference Books:

1. Teware. K.S. Vishnoi. N.K, MelhrotraS.N , A text books of Organic Chemistry , 2nd Revised edition.
2. Bahl. B.S. and ArunBahl , A text book of Organic Chemistry, 14th Edition.
3. Madan R.D, Modern Inorganic Chemistry, 2ND Edition.
4. Arora. M.G. Singh.M, Industrial chemistry Vol. II, Anmol publication Pvt. Ltd.
5. Soni.P .L, A text book of Organic Chemistry, 23rd Edit

PAPER- IV
BIO PHYSICAL CHEMISTRY

SEMESTER: IV
Hours / week: 3

SUBJECT CODE:
Total Hours Per semester: 45

The main objective of this paper is to introduce basic aspects of Spectroscopy, Photochemistry. Electrochemistry, Chemical kinetics and Chemical equilibrium.

UNIT - I

CHEMICAL KINETICS:

Rate equation – Rate constants or velocity constant – Order and molecularity of reaction – First order, Second order and third order rate equations (derivations)– Zero order reactions – Half life time of a reaction – Enzyme kinetics – MichaelisMentenKinetics.

UNIT – II

PHOTOCHEMISTRY:

Importance – Laws of photochemistry - Luminescence- Fluorescence – Phosphorescence – Chemiluminescence – Thermoluminescence – Bioluminescence – Photosensitization – Thermal reaction Vs Photochemical reaction – Biological applications of photochemistry - Quantum efficiency or Quantum yield.

UNIT – III

SPECTROSCOPY:

Types of spectra Atomic spectra and molecular spectra – Basic principles of UV, IR and ^1H NMR spectroscopy – (instrumentation not included) – Application of UV, IR and ^1H NMR techniques in the identification of simple organic molecules: - ethanol, acetaldehyde, acetic acid and phenol.

UNIT – IV

CHEMICAL EQUILIBRIUM:

Law of Mass action – Homogeneous equilibria;- Formation of HI – Dissociation of PCl_5
- Heterogeneous equilibria – Dissociation of CaCO_3 – LeChatelier – Brawn principle –
Application to formation of NH_3 and SO_3 .

UNIT – V

ELECTROCHEMISTRY:

EMF – Electrolytic conductors - Electrolysis – Faraday’s law of electrolysis –
Specific resistance and conductance – Equivalent conductance – Electro chemical cells –
Nernst equation – pH-definitions and calculation- Biological importance of pH - Types
of electrodes - Calomel electrode – Hydrogen electrode – Silver – Silver chloride
electrode – Standard electrode potential .

Text Books

1. Soni. P.L, Dharamarha O.P, Text book of physical chemistry, 1ST Edition.
2. Puri. B.R, Sharma L.R, Pathania.S, Principles of physical chemistry ,
38th edition.

Reference Books

1. Bahl. B.S, Tuli.G.D, Essentials of physical chemistry, 21st edition.
2. Walther J. Moore, Physical chemistry, Physical chemistry, 5th edition.
3. Samuel H. Maran Carl.F.pruttons, Principles of physical chemistry.

PRACTICAL – II

SEMESTER: IV
CODE: S3ACHL2

TIME: 2 hrs
MAX MARKS: 100

QUALITATIVE ANALYSIS OF ORGANIC COMPOUNDS

- I. Tests for aliphatic and aromatic compound
- II. Tests for saturation and unsaturation in organic compound
- III. Tests for the detection of elements: Halogen, nitrogen and sulphur.
- IV. Analysis of functional group: Acids, phenols, aromatic amines, aldehydes, ketones, esters, amides, urea and carbohydrates.
- V. Preparation of derivatives / colour reactions for the functional group.