B.Sc., Chemistry, I&II Year, CBCS Syllabus

	Telangana State Council of Higher Education, G	ovt. of Telang	ana B.Sc., CBC gana	S Common
	Core Syllabi for all Univer	CREDIT SV	STEM IN $/$	/
	PROPOSED SCHEME FOR CHOICE BASE	-2022	HTSa	/
	EIDST VEAR- SEMESTER		Departments of C	hemistry
	FIRST TEAR ODINESTED	COURSE	iversi HPW lege	CREDITS
CODE	COURSE IIILE	TYPE	hou, Hyderau	M-95.
	Course AECC-1	ES	2	2
BS 101	Ability Enhancement Compulsory Course ALCC 1	CC-1A	4	1
BS 102	English	CC-2A	4	1
BS 103	Second language	DSC-1A	4T+3P=7	4+1=5
BS 104	Optional I	DSC-2A	4T+3P=7	4+1=5
BS 105	Optional II		4T	4
BS 106	Optional III- Chemistry - 1	DSC-3A	= 7	=5
	Laboratory Course – 1 (Oualitative Analysis - Semi Micro Analysis of Mixtures)		3P	<u> </u>
	Total Credits		31	20
	FIRST YEAR- SEMSTER	II	2	2
BS 201	Ability Enhancement Compulsory Course AECC-2	BCS	2	<u> </u>
BS 202	English	CC-1B	4	4
BS 202	Second language	CC-2B	4	4
BS 203	Optional I	DSC-1B	41+3P-7	4+1=5
BS 204	Optional II	DSC-2B	41+3P=/	411 5
BS 205	Optional III- Chemistry - II			
B5 200	Lehersterry Course - II	DSC-3B	4T	4
	Laboratory Course - II		= 7	
	(Quantitative Analysis – Fittations)		3P	1
	Total Credits		31	25
	SECOND YEAR- SEMST	ER III		h
DG 201	:) Safety Rules in Chemistry Laboratory and Lab Reagents	SEC-1	2	2
B2 201	1) Salety Rules in Chemical Justice drinking water	SEC-2	2	2
	::) Remedial methods for pollution, ulliking water	~~~ -		
	ii) Remedial methods for pollution, drinking water and Soil fertility		2	2
DS 202	ii) Remedial methods for pollution, drinking water and Soil fertility English	CC-1C	3	3
BS 302	ii) Remedial methods for pollution, drinking water and Soil fertility English Second language	CC-1C CC-2C	3 3	3 3 (+1=5
BS 302 BS 303 BS 304	<ul> <li>ii) Remedial methods for pollution, drinking water and Soil fertility</li> <li>English</li> <li>Second language</li> <li>Optional I</li> </ul>	CC-1C CC-2C DSC-1C	3 3 4T+3P=7 4T+2P=7	3 3 4+1=5 4+1=5
BS 302 BS 303 BS 304 BS 305	<ul> <li>ii) Remedial methods for pollution, drinking water and Soil fertility</li> <li>English</li> <li>Second language</li> <li>Optional I</li> <li>Optional II</li> </ul>	CC-1C CC-2C DSC-1C DSC-2C	3 3 4T+3P=7 4T+3P=7	3 3 4+1=5 4+1=5
BS 302 BS 303 BS 304 BS 305 DS 306	<ul> <li>ii) Remedial methods for pollution, drinking water and Soil fertility</li> <li>English</li> <li>Second language</li> <li>Optional I</li> <li>Optional II</li> <li>Optional III- Chemistry - III</li> </ul>	CC-1C CC-2C DSC-1C DSC-2C	3 3 4T+3P=7 4T+3P=7	$   \begin{array}{r}     3 \\     3 \\     4+1=5 \\     4+1=5 \\     4 \\     5 \\     4 \\     4 \\     5 \\     4 \\     4 \\     5 \\     4 \\     4 \\     5 \\     4 \\     4 \\     5 \\     4 \\     4 \\     5 \\     4 \\     4 \\     5 \\     4 \\     5 \\     4 \\     4 \\     5 \\     4 \\     5 \\     4 \\     5 \\     4 \\     5 \\     4 \\     5 \\     4 \\     5 \\     4 \\     5 \\     4 \\     5 \\     4 \\     5 \\     4 \\     5 \\     5 \\     4 \\     5 \\     $
BS 302 BS 303 BS 304 BS 305 BS 306	<ul> <li>ii) Remedial methods for pollution, drinking water and Soil fertility</li> <li>English</li> <li>Second language</li> <li>Optional I</li> <li>Optional II</li> <li>Optional III- Chemistry - III</li> <li>Laboratory Course - III</li> </ul>	CC-1C CC-2C DSC-1C DSC-2C	3 3 4T+3P=7 4T+3P=7 4T	3 3 4+1=5 4+1=5 4
BS 302 BS 303 BS 304 BS 305 BS 306	<ul> <li>ii) Remedial methods for pollution, drinking water and Soil fertility</li> <li>English</li> <li>Second language</li> <li>Optional I</li> <li>Optional II</li> <li>Optional III- Chemistry - III</li> <li>Laboratory Course - III</li> <li>(Synthesis of Organic compounds )</li> </ul>	CC-1C CC-2C DSC-1C DSC-2C DSC-2C	$   \begin{array}{r}     3 \\     3 \\     4T+3P=7 \\     4T+3P=7 \\     4T \\     = 7 \\     2P   \end{array} $	$3 \\ 3 \\ 4+1=5 \\ 4+1=5 \\ 4 \\ 4 \\ = 1$
BS 302 BS 303 BS 304 BS 305 BS 306	<ul> <li>ii) Remedial methods for pollution, drinking water and Soil fertility</li> <li>English</li> <li>Second language</li> <li>Optional I</li> <li>Optional III- Chemistry - III</li> <li>Laboratory Course - III</li> <li>(Synthesis of Organic compounds )</li> </ul>	CC-1C CC-2C DSC-1C DSC-2C DSC-3C	$   \begin{array}{r}     3 \\     3 \\     4T+3P=7 \\     4T+3P=7 \\     4T \\     = 7 \\     3P \\     21   \end{array} $	$ \begin{array}{c} 3 \\ 3 \\ 4+1=5 \\ 4+1=5 \\ 4 \\ 1 \\ 25 \\ \end{array} $
BS 302 BS 303 BS 304 BS 305 BS 306	<ul> <li>ii) Remedial methods for pollution, drinking water and Soil fertility</li> <li>English</li> <li>Second language</li> <li>Optional I</li> <li>Optional II</li> <li>Optional III- Chemistry - III</li> <li>Laboratory Course - III</li> <li>(Synthesis of Organic compounds )</li> <li>Total Credits</li> </ul>	CC-1C CC-2C DSC-1C DSC-2C DSC-3C	$3 \\ 3 \\ 4T+3P=7 \\ 4T+3P=7 \\ 4T \\ = 7 \\ 3P \\ 31$	$   \begin{array}{r}     3 \\     3 \\     4+1=5 \\     4+1=5 \\     4 \\     1 \\     25 \\   \end{array} $
BS 302 BS 303 BS 304 BS 305 BS 306	<ul> <li>ii) Remedial methods for pollution, drinking water and Soil fertility</li> <li>English</li> <li>Second language</li> <li>Optional I</li> <li>Optional III</li> <li>Optional III- Chemistry - III</li> <li>Laboratory Course - III</li> <li>(Synthesis of Organic compounds )</li> <li>Total Credits</li> <li>SECOND YEAR- SEMST</li> </ul>	CC-1C CC-2C DSC-1C DSC-2C DSC-3C	$   \begin{array}{r}     3 \\     3 \\     4T+3P=7 \\     4T+3P=7 \\     4T \\     = 7 \\     3P \\     31 \\   \end{array} $	$ \begin{array}{c} 3 \\ 3 \\ 4+1=5 \\ 4+1=5 \\ 4 \\ 1 \\ 25 \\ 2 \\ 3 \\ 2 \\ 3 \\ 3 \\ 4 \\ 4 \\ 5 \\ 2 \\ 5 \\ 2 \\ 5 \\ 2 \\ 5 \\ 2 \\ 5 \\ 5 \\ 5 \\ 5 \\ 5 \\ 5 \\ 5 \\ 5 \\ 5 \\ 5$
BS 302 BS 303 BS 304 BS 305 BS 306	<ul> <li>ii) Remedial methods for pollution, drinking water and Soil fertility</li> <li>English</li> <li>Second language</li> <li>Optional I</li> <li>Optional III- Chemistry - III</li> <li>Optional III- Chemistry - III</li> <li>Laboratory Course - III</li> <li>(Synthesis of Organic compounds )</li> <li>Total Credits</li> <li>SECOND YEAR- SEMST</li> <li>i) Materials and their Applications</li> </ul>	CC-1C CC-2C DSC-1C DSC-2C DSC-3C ER IV SEC-3	$   \begin{array}{r}     3 \\     3 \\     4T+3P=7 \\     4T+3P=7 \\     4T \\     = 7 \\     3P \\     31 \\   \end{array} $	$ \begin{array}{c} 3 \\ 3 \\ 4+1=5 \\ 4+1=5 \\ 4 \\ 1 \\ 25 \\ 2 \\ 2 \end{array} $
BS 302 BS 303 BS 304 BS 305 BS 306 BS 401	<ul> <li>ii) Remedial methods for pollution, drinking water and Soil fertility</li> <li>English</li> <li>Second language</li> <li>Optional I</li> <li>Optional III- Chemistry - III</li> <li>Laboratory Course - III</li> <li>(Synthesis of Organic compounds )</li> <li>Total Credits</li> <li>SECOND YEAR- SEMST</li> <li>i) Materials and their Applications</li> <li>ii) Chemistry of Cosmetics and Food Processing</li> </ul>	CC-1C CC-2C DSC-1C DSC-2C DSC-3C DSC-3C	$   \begin{array}{r}     3 \\     3 \\     4T+3P=7 \\     4T+3P=7 \\     4T \\     = 7 \\     3P \\     31 \\   \end{array} $	$ \begin{array}{c} 3 \\ 3 \\ 4+1=5 \\ 4+1=5 \\ 4 \\ 1 \\ 25 \\ 2 \\ 2 \\ 3 \\ 3 \\ 3 \\ 3 \\ 4+1=5 \\ 4 \\ 5 \\ 2 \\ 2 \\ 3 \\ 3 \\ 4 \\ 5 \\ 5 \\ 5 \\ 5 \\ 5 \\ 5 \\ 5 \\ 5 \\ 5 \\ 5$
BS 302 BS 303 BS 304 BS 305 BS 306 BS 401	<ul> <li>ii) Remedial methods for pollution, drinking water and Soil fertility</li> <li>English</li> <li>Second language</li> <li>Optional I</li> <li>Optional III- Chemistry - III</li> <li>Laboratory Course - III</li> <li>(Synthesis of Organic compounds )</li> <li>Total Credits</li> <li>SECOND YEAR- SEMST</li> <li>i) Materials and their Applications</li> <li>ii) Chemistry of Cosmetics and Food Processing</li> <li>English</li> </ul>	CC-1C CC-2C DSC-1C DSC-2C DSC-3C VER IV SEC-3 SEC-4 CC-1D	$   \begin{array}{r}     3 \\     3 \\     4T+3P=7 \\     4T+3P=7 \\     4T \\     = 7 \\     3P \\     31 \\   \end{array} $	$ \begin{array}{c} 3 \\ 3 \\ 4+1=5 \\ 4+1=5 \\ 4 \\ 1 \\ 25 \\ 2 \\ 3 \\ 3 \\ 3 \\ 3 \\ 3 \\ 3 \\ 3 \\ 3 \\ 3 \\ 3$
BS 302 BS 303 BS 304 BS 305 BS 306 BS 401 BS 402 BS 402 BS 403	<ul> <li>ii) Remedial methods for pollution, drinking water and Soil fertility</li> <li>English</li> <li>Second language</li> <li>Optional I</li> <li>Optional III- Chemistry - III</li> <li>Laboratory Course - III</li> <li>(Synthesis of Organic compounds )</li> <li>Total Credits</li> <li>SECOND YEAR- SEMST</li> <li>i) Materials and their Applications</li> <li>ii) Chemistry of Cosmetics and Food Processing</li> <li>English</li> <li>Second language</li> </ul>	CC-1C CC-2C DSC-1C DSC-2C DSC-2C DSC-3C ER IV SEC-3 SEC-4 CC-1D CC-2D	$   \begin{array}{r}     3 \\     3 \\     4T+3P=7 \\     4T+3P=7 \\     4T \\     = 7 \\     3P \\     31 \\   \end{array} $ $   \begin{array}{r}     2 \\     2 \\     3 \\     3 \\     4T+3P=7 \\   \end{array} $	$ \begin{array}{c} 3 \\ 3 \\ 4+1=5 \\ 4+1=5 \\ 4 \\ 1 \\ 25 \\ 2 \\ 3 \\ 3 \\ 4+1=5 \\ 4 \\ 4 \\ 5 \\ 5 \\ 5 \\ 5 \\ 5 \\ 5 \\ 5 \\ 5 \\ 5 \\ 5$
BS 302 BS 303 BS 304 BS 305 BS 306 BS 401 BS 402 BS 403 BS 404	<ul> <li>ii) Remedial methods for pollution, drinking water and Soil fertility</li> <li>English</li> <li>Second language</li> <li>Optional II</li> <li>Optional III- Chemistry - III</li> <li>Laboratory Course - III</li> <li>(Synthesis of Organic compounds )</li> <li>Total Credits</li> <li>SECOND YEAR- SEMST</li> <li>i) Materials and their Applications</li> <li>ii) Chemistry of Cosmetics and Food Processing</li> <li>English</li> <li>Second language</li> <li>Optional I</li> </ul>	CC-1C         CC-2C         DSC-1C         DSC-3C         PER IV         SEC-3         SEC-4         CC-1D         CC-2D         DSC-1D	3 $3$ $4T+3P=7$ $4T+3P=7$ $4T$ $= 7$ $3P$ $31$ $2$ $2$ $3$ $3$ $4T+3P=7$ $4T+3P=7$	$ \begin{array}{c} 3 \\ 3 \\ 4+1=5 \\ 4+1=5 \\ 4 \\ = 1 \\ 25 \\ 2 \\ 2 \\ 3 \\ 3 \\ 4+1=5 \\$
BS 302 BS 303 BS 304 BS 305 BS 306 BS 306 BS 401 BS 402 BS 403 BS 404 BS 405	<ul> <li>ii) Remedial methods for pollution, drinking water and Soil fertility</li> <li>English</li> <li>Second language</li> <li>Optional I</li> <li>Optional III- Chemistry - III</li> <li>Laboratory Course - III</li> <li>(Synthesis of Organic compounds )</li> <li>Total Credits</li> <li>SECOND YEAR- SEMST</li> <li>i) Materials and their Applications</li> <li>ii) Chemistry of Cosmetics and Food Processing</li> <li>English</li> <li>Second language</li> <li>Optional I</li> <li>Optional I</li> </ul>	CC-1C         CC-2C         DSC-1C         DSC-3C         PER IV         SEC-3         SEC-4         CC-1D         CC-2D         DSC-2D	3 $4T+3P=7$ $4T+3P=7$ $4T$ $= 7$ $3P$ $31$ $2$ $2$ $2$ $3$ $3$ $4T+3P=7$ $4T+3P=7$ $4T+3P=7$	$ \begin{array}{c} 3 \\ 3 \\ 4+1=5 \\ 4+1=5 \\ 4 \\ = 1 \\ 25 \\ 2 \\ 2 \\ 3 \\ 3 \\ 4+1=5 \\ 4+1=5 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4$
BS 302 BS 303 BS 304 BS 305 BS 306 BS 306 BS 401 BS 401 BS 403 BS 404 BS 405 BS 405 BS 406	<ul> <li>ii) Remedial methods for pollution, drinking water and Soil fertility</li> <li>English</li> <li>Second language</li> <li>Optional I</li> <li>Optional III- Chemistry - III</li> <li>Laboratory Course - III</li> <li>(Synthesis of Organic compounds )</li> <li>Total Credits</li> <li>SECOND YEAR- SEMST</li> <li>i) Materials and their Applications</li> <li>ii) Chemistry of Cosmetics and Food Processing</li> <li>English</li> <li>Second language</li> <li>Optional II</li> <li>Optional II</li> <li>Optional II</li> <li>Optional II</li> </ul>	CC-1C CC-2C DSC-1C DSC-2C DSC-2C DSC-3C ER IV SEC-3 SEC-4 CC-1D CC-2D DSC-1D DSC-1D	$   \begin{array}{r} 3 \\ 3 \\ 4T+3P=7 \\ 4T+3P=7 \\ 4T \\ = 7 \\ 3P \\ 31 \\ \hline   \begin{array}{r} 2 \\ 2 \\ 3 \\ 3 \\ 4T+3P=7 \\ 4T+3P=7 \\ 4T \\ 4T \\ = 7 \\ 4T \\ - 7 \end{array} $	$ \begin{array}{c} 3 \\ 3 \\ 4 + 1 = 5 \\ 4 + 1 = 5 \\ 4 \\ 1 \\ 25 \\ 2 \\ 2 \\ 3 \\ 3 \\ 4 + 1 = 5 \\ 4 + 1 = 5 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4 \\ 4$
BS 302 BS 303 BS 304 BS 305 BS 306 BS 306 BS 401 BS 401 BS 402 BS 403 BS 404 BS 405 BS 406	<ul> <li>ii) Remedial methods for pollution, drinking water and Soil fertility</li> <li>English</li> <li>Second language</li> <li>Optional I</li> <li>Optional III- Chemistry - III</li> <li>Laboratory Course - III</li> <li>(Synthesis of Organic compounds )</li> <li>Total Credits</li> <li>SECOND YEAR- SEMST</li> <li>i) Materials and their Applications</li> <li>ii) Chemistry of Cosmetics and Food Processing</li> <li>English</li> <li>Second language</li> <li>Optional II</li> <li>Optional II</li> <li>Optional II</li> <li>Optional II</li> <li>Optional II</li> <li>Second language</li> <li>Optional II</li> <li>Optional II</li> <li>Optional II</li> <li>Optional II</li> <li>Optional II</li> <li>Optional III- Chemistry - IV</li> <li>Laboratory Course - IV</li> </ul>	CC-1C CC-2C DSC-1C DSC-2C DSC-2C DSC-3C ER IV SEC-3 SEC-3 SEC-4 CC-1D CC-2D DSC-1D DSC-1D DSC-2D DSC-3D	$ \begin{array}{c} 3 \\ 3 \\ 4T+3P=7 \\ 4T+3P=7 \\ 4T \\ = 7 \\ 3P \\ 31 \\ \end{array} $ $ \begin{array}{c} 2 \\ 2 \\ 3 \\ 3 \\ 4T+3P=7 \\ 4T+3P=7 \\ 4T+3P=7 \\ 4T \\ = 7 \\ 3P \\ \end{array} $	$ \begin{array}{c} 3 \\ 3 \\ 4 + 1 = 5 \\ 4 + 1 = 5 \\ 4 \\ 1 \\ 25 \\ 2 \\ 2 \\ 3 \\ 3 \\ 4 + 1 = 5 \\ 4 \\ 1 \\ 1 \end{array} $
BS 302 BS 303 BS 304 BS 305 BS 306 BS 306 BS 401 BS 401 BS 402 BS 403 BS 404 BS 405 BS 406	<ul> <li>ii) Remedial methods for pollution, drinking water and Soil fertility</li> <li>English</li> <li>Second language</li> <li>Optional II</li> <li>Optional III- Chemistry - III</li> <li>Laboratory Course - III</li> <li>(Synthesis of Organic compounds )</li> <li>Total Credits</li> <li>SECOND YEAR- SEMST</li> <li>i) Materials and their Applications</li> <li>ii) Chemistry of Cosmetics and Food Processing</li> <li>English</li> <li>Second language</li> <li>Optional II</li> <li>Optional III- Chemistry - IV</li> <li>Laboratory Course - IV</li> <li>(Ovalitative Analysis of Organic Compounds)</li> </ul>	CC-1C         CC-2C         DSC-1C         DSC-2C         DSC-3C         FER IV         SEC-3         SEC-4         CC-1D         CC-2D         DSC-1D         DSC-2D         DSC-3D	$   \begin{array}{r} 3 \\       3 \\       4T+3P=7 \\       4T+3P=7 \\       4T \\       = 7 \\       3P \\       31 \\   \end{array} $ $   \begin{array}{r} 4T \\       = 7 \\       3P \\       31 \\   \end{array} $ $   \begin{array}{r} 4T \\       2 \\       2 \\       3 \\       3 \\       4T+3P=7 \\       4T+3P=7 \\       4T+3P=7 \\       4T \\       = 7 \\       3P \\   \end{array} $	$ \begin{array}{c} 3 \\ 3 \\ 4 + 1 = 5 \\ 4 + 1 = 5 \\ 4 \\ 1 \\ 25 \\ 2 \\ 2 \\ 3 \\ 3 \\ 4 + 1 = 5 \\ 4 + 1 = 5 \\ 4 \\ 1 \\ 25 \\ 4 \\ 25 \\ 4 \\ 1 \\ 25 \\ 4 \\ 1 \\ 25 \\ 4 \\ 1 \\ 25 \\ 4 \\ 1 \\ 25 \\ 4 \\ 25 \\ 25 \\ 25 \\ 25 \\ 25 \\ 25 \\ 25 \\ 25$
BS 302 BS 303 BS 304 BS 305 BS 306 BS 401 BS 401 BS 403 BS 404 BS 405 BS 406	<ul> <li>ii) Remedial methods for pollution, drinking water and Soil fertility</li> <li>English</li> <li>Second language</li> <li>Optional II</li> <li>Optional III- Chemistry - III</li> <li>Laboratory Course - III (Synthesis of Organic compounds )</li> <li>Total Credits</li> <li>SECOND YEAR- SEMST</li> <li>i) Materials and their Applications</li> <li>ii) Chemistry of Cosmetics and Food Processing</li> <li>English</li> <li>Second language</li> <li>Optional II</li> <li>Optional III- Chemistry - IV</li> <li>Laboratory Course - IV</li> <li>(Qualitative Analysis of Organic Compounds)</li> <li>Total Credits</li> </ul>	CC-1C         CC-2C         DSC-1C         DSC-2C         DSC-3C         ER IV         SEC-3         SEC-4         CC-1D         CC-2D         DSC-1D         DSC-2D         DSC-3D	$   \begin{array}{r}     3 \\     3 \\     4T+3P=7 \\     4T+3P=7 \\     4T \\     = 7 \\     3P \\     31 \\   \end{array} $ $   \begin{array}{r}     4T \\     = 7 \\     3P \\     31 \\   \end{array} $ $   \begin{array}{r}     4T \\     4T+3P=7 \\     4T+3P=7 \\     4T \\     = 7 \\     3P \\     31 \\   \end{array} $	$ \begin{array}{r} 3 \\ 3 \\ 4 + 1 = 5 \\ 4 + 1 = 5 \\ 4 \\ 1 \\ 2 \\ 2 \\ 3 \\ 3 \\ 4 + 1 = 5 \\ 4 \\ 4 \\ 1 \\ 2 \\ 4 \\ 1 \\ 2 \\ 2 \\ 3 \\ 3 \\ 4 + 1 = 5 \\ 4 \\ 1 \\ 2 \\ 2 \\ 3 \\ 3 \\ 4 + 1 = 5 \\ 4 \\ 1 \\ 2 \\ 3 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 3 \\ 3 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 4 \\ 1 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 4 \\ 1 \\ 2 \\ 3 \\ 3 \\ 4 \\ 1 \\ 3 \\ 4 \\ 1 \\ 3 \\ 4 \\ 1 \\ 3 \\ 4 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1$

\* AECC: Ability Enhancement Compulsory Course, SEC: Skill Enhancement Course, DSC: Discipline Pre-Course, GE: Generic Elective, ES: Environmental Science, BCS: Basic computer skills.

### B. Sc. Chemistry, III year, CBCS Syllabus Telangana State Council of Higher Education, Govt. of Telangana, B.Sc. CBCS Common Core Syllabus for all Universities in Telangana

B. Sc. Chemistry (For the batch admitted in 2019-2020)

	THIRD YEAR - SEMES	TER V			
CODE	COURSE TITLE	COURSE TYPE	HPW	CREDITS	
BS 501	Chemistry of Cosmetics, Food Processing, Drugs and Pharmaceuticals	GE	4	4	
BS 502	English	CC-1E	3	3	
BS 503	Second language	CC-2E	3	3	
BS 504	Optional - I A/B	DSE -IE		4+1=5	
BS 505	Optional - II A/B	DSE -2E		4+1=5	
BS 506	Optional- III A/B				
	A. Spectroscopy and Chromatography (or) B. Metallurgy, Dyes and Catalysis	DSE -3E	4T and 3P = 7	4 = 5	
	Laboratory Course - v Experiments in Physical Chemistry-I			-	
	TOTAL			25	
THIRD YEAR- SEMESTER VI					
BS 601	Project in Chemistry/ Advanced Chemistry			4	
BS 602	English	CC-IF	3		
BS 603	Second language	CC-2F	3	3	
BS 604	Optional - I A/B	DSE-IF		4+1=5	
BS 605	Optional - II A/B	DSE -2F	× •	4+1=5	
BS 606	Optional- III A/B A. Medicinal Chemistry	DSE -3F	4T	4	
	(or) <b>B. Agricultural and Fuel Chemistry</b> Laboratory Course -V1 Experiments in Physical Chemistry-II	_	= 7 3P	= 5	
	TOTAL			25	
	TOTAL Credits			150	
	And Anti- 122 Mar - 2	H. Lewith	s of C	Dally	
	mb l	×	NO N-		

डॉ.एम.एस. राधिका, पीएचडी (पोषण) Dr. M.S. RADHIKA, PhD (Nutrition) कैलानिक-ई (उप निरेशक) व विभावाम्प्रास Science: & Head of the Department आहारविज्ञानविभाग, आईसीएमआर-राष्ट्रीयपोषणसंस्थान Department of Dieteics, ICMR-National Institute of Nutrition आहारव्याच्या libre: पीज्य?201000.00 and and जाने-उस्मानिया (पोस्ट), सिकदराबाद-५००० ००७, भारत Jamai-Osmania (PO), Secunderabad-500 007 INDIA

### B.Sc. I Yr CHEMISTRY SEMESTER WISE SYLLABUS SEMESTER II

### (For the batch admitted in 2021-2022) onwards

### Paper - II

Chemistry - II

### Unit-I (Inorganic Chemistry)

### 15 h (1hr/week)

7h

### S2-I-1: p-block Elements-II

**Oxides**: Types of oxides (a) Normal - acidic, basic amphoteric and neutral (b) Mixed (c) sub oxide (d) peroxide e) superoxide. Structure of oxides of C, N, P, S and Cl - reactivity, thermal stability, hydrolysis.

**Oxy acids**: Structure and acidic nature of oxyacids of B, C, N (HNO<sub>2</sub>, HNO<sub>3</sub>, H<sub>2</sub>N<sub>2</sub>O<sub>2</sub>, HNO<sub>4</sub>) P (H<sub>3</sub>PO<sub>2</sub>, H<sub>3</sub>PO<sub>3</sub>) S (H<sub>2</sub>SO<sub>3</sub>, H<sub>2</sub>SO<sub>4</sub>, H<sub>2</sub>S<sub>2</sub>O<sub>3</sub>, H<sub>2</sub>SO<sub>5</sub>, H<sub>2</sub>S<sub>2</sub>O<sub>8</sub>) P, S, Cl and I. Redox properties of oxyacids of Nitrogen: HNO<sub>2</sub> (reaction with FeSO<sub>4</sub>, KMnO<sub>4</sub>, K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>), HNO<sub>3</sub> (reaction with H<sub>2</sub>S, Cu), HNO<sub>4</sub> (reaction with KBr, Aniline), H<sub>2</sub>N<sub>2</sub>O<sub>2</sub> (reaction with KMnO<sub>4</sub>). Redox properties of oxyacids of Phosphorus: H<sub>3</sub>PO<sub>2</sub> (reaction with HgCl<sub>2</sub>), H<sub>3</sub>PO<sub>3</sub> (reaction with AgNO<sub>3</sub>, CuSO<sub>4</sub>) Redox properties of oxyacids of Sulphur: H<sub>2</sub>SO<sub>3</sub>, H<sub>2</sub>SO<sub>3</sub> (reaction with KMnO<sub>4</sub>, K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>), H<sub>2</sub>SO<sub>4</sub> (reaction with Zn, Fe, Cu), H<sub>2</sub>S<sub>2</sub>O<sub>3</sub> (reaction with Cu, Au), H<sub>2</sub>SO<sub>5</sub> (reaction with KI, FeSO<sub>4</sub>), H<sub>2</sub>S<sub>2</sub>O<sub>8</sub> (reaction with FeSO<sub>4</sub>, KI). Redox properties of oxyacids of Chlorine.

Interhalogens- Classification- general preparation- structures of AB, AB<sub>3</sub>, AB<sub>5</sub> and AB<sub>7</sub> type and reactivity

**Poly halides-** Definition and structure of  $ICl_2^-$ ,  $ICl_4^-$  and  $I_3$ .

Pseudohalogens: Comparison with halogens.

### S2-I-2: Chemistry of Zero group elements

Isolation of noble gases (chemico – physical method), Structure, bonding and reactivity of Xenon compounds – Oxides, Halides and Oxy-halides. Clatherate compounds and Anomalous behavior of He (II)

### S2-I-3: Chemistry of d-block elements

Characteristics of d-block elements with special reference to atomic and ionic radii, metallic character, formation of alloys, electronic configuration, variable valence, ability to form complexes, magnetic properties & catalytic properties. Stability of various oxidation states. Comparative treatment of second and third transition series with their 3d analogues. Study of Ti, Cr and Cu traids. Titanium triad – electronic configuration and reactivity of +3 and +4 states–oxides and halides. Chromium triad – reactivity of +3 and +6 states. Copper triad – reactivity of +1, +2 and +3 states.

डॉ.एर्स.एस. राधिक, पीएचडी (पोषण) Dr. M. S. RADHIKA, Pho (Nutrition) बैजानिक-ई (उप निरोधक) व विभावणयस Science-E & Head of the Department आहारविज्ञानविभाग, आई सीएमआर-राष्ट्रीयपोषणसंस्थान Department of Dietetics. ICMR-National Institute of Nutrition जाबे-प्रसारिय (प्रेरट), एक शारर

67 IN

6 h

### Unit – II (Organic Chemistry)

### S2-O-1: Halogen compounds

Nomenclature, Classification: alkyl (primary, secondary, tertiary), aryl, aralkyl, allyl, vinyl, benzyl. Chemical reactivity - reduction, formation of RMgX, Nucleophilic substitution reactions – classification into  $S_N^1$  and  $S_N^2$ . Mechanism and energy profile diagrams of  $S_N^1$  and  $S_N^2$  reactions. Stereochemistry of  $S_N^2$  (Walden Inversion) 2-bromobutane,  $S_N^1$  (Racemisation) 1-bromo-1-phenyl propane, Structure and reactivity – Ease of hydrolysis - comparison of alkyl, vinyl, allyl, aryl and benzyl halides.

### S2-O-2: Hydroxy compounds and Ethers

**Alcohols:** Nomenclature, Preparation: 1°, 2° and 3° alcohols using Grignard reagent, Reduction of Carbonyl compounds, carboxylic acids and esters. Physical properties: H-bonding, Boiling point and Solubility. Reactions with Sodium, HX/ZnCl<sub>2</sub> (Lucas reagent), esterification, oxidation with PCC, alk. KMnO<sub>4</sub>, acidic dichromates, Conc. HNO<sub>3</sub> and Oppenauer oxidation (Mechanism).

**Phenols**: Nomenclature, Preparation: (i) from diazonium salts of anilines, (ii) from benzene sulphonic acids and (iii) Cumene hydroperoxide.

Properties: Acidic nature, formation of phenoxide and reaction with R-X, electrophilic substitution; halogenations, Riemer-Tiemann reaction (Mechanism), Kolbe reaction (Mechanism), Gattermann-Koch reaction, Azo-coupling reaction, Schotten-Baumann reaction, Houben-Hoesch condensation.

**Ethers:** Nomenclature, preparation by (a) Williamson's synthesis (b) from alkenes by the action of Conc.  $H_2SO_4$ . Physical properties – solubility - Absence of Hydrogen bonding, insoluble in water, low boiling point. Chemical properties – inert nature, action of Conc.  $H_2SO_4$  and HI.

### S2-O-3: Carbonyl compounds

Nomenclature, Preparation of aldehydes & ketones from acid chloride,1,3-dithianes, nitriles and from carboxylic acids. Special methods of preparing aromatic aldehydes and ketones by (a) Oxidation of arenes

(b) Hydrolysis of benzal halides. Physical properties – absence of Hydrogen bonding. Reactivity of the carbonyl groups in aldehydes and ketones. Chemical reactivity: Addition of (a) NaHSO<sub>3</sub> (mechanism) (b) HCN (c) NH<sub>3</sub> (d) RNH<sub>2</sub> (e) NH<sub>2</sub>OH (f) PhNHNH<sub>2</sub> (g) 2,4-DNP (Schiff bases). Addition of H<sub>2</sub>O to form hydrate, chloral hydrate (stable), addition of alcohols - hemi acetal and acetal formation. Cannizzaro reaction (mechanism). Oxidation reactions – KMnO<sub>4</sub> oxidation and auto-oxidation, mechanism of Clemmenson's reduction, Wolf-Kishner reduction, Meerwein Ponndorf Verley reduction.

 

 डा.एम.एस. राधिका, पीएवडी (पोषण)

 pr. M.S. RAPHIKA, PhD (Nutrition)

 वैज्ञानिकःई (उप निदेशक) व विभावाध्यस Science-E & Head of the Department

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### 15h (1 hr/week)

### Unit – III (Physical Chemistry)

### 15 h (1hr/week)

15 h

### S2-P-1: Electrochemistry

Electrical transport – conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance, measurement of equivalent conductance, variation of specific and equivalent conductance with dilution. Migration of ions and Kholrausch's law, Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes, Ostwald's dilution law - its uses and limitations. Debye-Huckel-Onsagar's equation for strong electrolytes (elementary treatment only). Transport number, definition and determination by Hittorf's method for Non-attackable and attackable electrodes. Applications of conductivity measurements: Determination of degree of dissociation, determination of  $K_a$  of acids, determination of solubility product of a sparingly soluble salt, conductometric titrations.

Electrolytic and Galvanic cells – reversible and irreversible cells, conventional representation of electrochemical cells. Electro motive force (EMF) of a cell and its measurement. Problems on EMF and Single electrode potential, Nernst equation, – standard electrode potential, sign conventions, Types of reversible electrodes- the gas electrode, metal-metal ion, metal-insoluble salt and redox electrodes, Standard Hydrogen electrode–reference electrodes (calomel electrode), electrochemical series and its significance. Applications of EMF measurements. Calculation of thermodynamic quantities of cell reactions (Gibbs free energy G, Helmholtz free energy and Equilibrium constant K). Determination of pH using glass electrode. Solubility product of AgCl. Potentiometric titrations.

### Unit – IV (General Chemistry)

### S2-G-1: Theory of Quantitative Analysis

*Volumetric Analysis*: Introduction, standard solutions, indicators, end point, titration curves, Types of titrations: i) neutralization titration- principle, theory of acid base indicators, titration curves and selection of indicators- strong acid - strong base, strong acid -weak base, weak acid-strong base and weak acid -weak base. Theory of redox titrations – internal (KMnO<sub>4</sub>) and external indicators – use of diphenylamine and ferroin indicators. Theory of complexometric titrations – use of EBT, Murexide and Fast sulphone black indicators. Role of pH in complexometric titrations. Precipitation titrations – theory of adsorption indicators.

**Gravimetric analysis-** Introduction, nucleation, precipitation, growth of precipitate, filtration and washing, drying and incineration of precipitate, co-precipitation and post precipitation. Determination of Ni<sup>2+</sup>

### S2-G-2: Stereoisomerism

**Optical activity:** Definition, wave nature of light, plane polarised light, optical rotation and specific rotation, chiral centers. Chiral molecules: definition and criteria - absence of plane, center and  $S_n$  axis of symmetry – asymmetric and dissymmetric molecules. Examples of asymmetric molecules (Glyceraldehyde, Lactic acid, Alanine) and dissymmetric molecules (trans

### 15 h (1hr/week)

6h

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1,2-dichloro cyclopropane). Molecules with constitutionally symmetrical chiral carbons (Tartaric acid) Molecules with constitutionally unsymmetrical chiral carbons (2,3-dibromopentane). D, L configuration – examples. R, S – configuration: Cahn-Ingold-Prelog rules, examples for asymmetric and disymmetric molecules.

### S2-G-3: Dilute Solutions & Colligative Properties

4h

Dilute Solutions, Colligative Properties, Raoult's law, Relative lowering of vapour pressure, molecular weight determination. Osmosis - laws of osmotic pressure, its measurement, determination of molecular weight from osmotic pressure. Elevation of boiling point and Depression of freezing point. Derivation of relation between molecular weight and elevation in boiling point and depression in freezing point.

### References

General Reference: B.Sc. I Year Chemistry : Semester II, Telugu Academy publication, Hyd.

### Unit I

- 1. Principles of Inorganic Chemistry by Puri, Sharma and Kalia VishalPublications1996.
- 2. Concise Inorganic Chemistry by J.D. Lee 3rd Edition.
- 3.Basic Inorganic Chemistry by F.A.Cotton, G.Wilkinson and Paul.L. Gaus 3<sup>rd</sup> Edition. Wiley Publishers 2001.
- 4. Chemistry of the elements by N.N.Greenwood and A. Earnshaw Pergamon Press 1989.
- 5. Inorganic Chemistry by Shriver and Atkins 3rd Edition. Oxford Press 1999.
- Inorganic Chemistry Principles of structure and reactivity by James E. Huhey, E.A. Keiter and R.L. Keiter 4<sup>th</sup> Edition.
- 7. Textbook of inorganic chemistry by R Gopalan.

### Unit II

- 1. Organic Chemistry by Morrison and Boyd.
- 2. Organic Chemistry by Graham Solomons.
- 3. Organic Chemistry by BruiceYuranis Powla.
- 4. Organic Chemistry by L. G. Wade Jr.
- 5. Organic Chemistry by M. Jones, Jr
- 6. Organic Chemistry by John McMurry.
- 7. Organic Chemistry by Soni.
- 8. General Organic chemistry by Sachin Kumar Ghosh.
- 9. Organic Chemistry by C N Pillai.
- 10. Organic Chemistry by Jain & Sharma.

### Unit III

- 1. Physical chemistry by P WAtkins
- 2. Principles of physical chemistry by Prutton and Marron.
- 3. Text Book of Physical Chemistry by Soni and Dharmahara.
- 4. Text Book of Physical Chemistry by Puri and Sharma

10

- 5. Text Book of Physical Chemistry by K. L.Kapoor
- 6. Physical Chemistry through problems by S.K.Dogra.
- 7. Elements of Physical Chemistry by Lewis and Glasstone.

### Unit IV

- 1. Vogel's Text Book of Quantitative Analysis by G.H.Jeffery, J.Bassett, J.Mendham and R.C. Denney 5<sup>th</sup> Edition. Addison Wesley Longman Inc.1999.
- 2. Quantitative Analysis by Day and Underwood Prentice Hall (India) 6th Edition.
- 3. Stereochemistry by Nasipuri
- 4. Stereochemistry by P. S. Kalsi
- 5. Physical chemistry by P W Atkins
- 6. Principles of physical chemistry by Prutton and Marron.
- 7. Text Book of Physical Chemistry by Soni and Dharmahara.
- 8. Text Book of Physical Chemistry by Puri and Sharma

### Laboratory Course

45hrs (3 h /week)

### Paper II - Quantitative Analysis

### Acid - Base titrations

- 1. Estimation of Carbonate in Washing Soda.
- 2. Estimation of Bicarbonate in Baking Soda.
- 3. Estimation of Carbonate and Bicarbonate in the Mixture.
- 4. Estimation of Alkali content in Antacid using HCl.
- 5. Estimation of  $NH_4^+$  by back titration.

### **Redox** Titrations

- 1. Determination of Fe(II) using K2Cr2O7.
- 2. Determination of Fe(II) using KMnO4 with sodium oxalate as primary standard.
- 3. Determination of Cu(II) using Na2S2O3 with K2Cr2O7 as primary standard.

### **Complexometric Titrations**

- 1. Estimation of Mg<sup>2+</sup>
- 2. Estimation of  $Cu^{2+}$

### **References:**

1. Lab manual for UG students prepared by Department of Chemistry, University College for Women, Koti, Hyd.

11

2. Vogel's Quantitative Inorganic Analysis by Svehla.

### B.Sc. II yr CHEMISTRY SEMESTER WISE SYLLABUS SEMESTER IV (For the batch admitted in 2020-2021) onwards Paper-IV Chemistry - IV

### Unit-I (Inorganic Chemistry)

### S4-I-1: Coordination Compounds-II

Crystal field theory (CFT) - Postulates of CFT, splitting patterns of d-orbitals in Octahedral, tetrahedral, square planar with suitable examples. Crystal field stabilization energies and its calculations for various  $d_n$  configurations in octahedral complexes. High Spin & Low Spin complexes. Colour and Magnetic properties of transition metal complexes. Calculations of magnetic moments spin only formula. Detection of complex formation - basic principles of various methods- change in chemical properties, solubility, colour, pH, conductivity, magnetic susceptibility.

Hard and soft acids bases (HSAB) - Classification, Pearson's concept of hardness and softness, application of HSAB principles – Stability of compounds / complexes, predicting the feasibility of reaction. Thermodynamic and kinetic stability of transition of metal complexes. Stability of metal complexes –stepwise and overall stability constant and their relationship and chelate effect determination of composition of complex by Job's method and mole ratio method.

Applications of coordination compounds: Applications of coordination compounds a) in quantitative and qualitative analysis with suitable examples b) in medicine for removal of toxic metal ions and cancer therapy c) in industry as catalysts polymerization – Ziegler Natta catalyst d) water softening.

### S4-I-2: Bioinorganic Chemistry

Essential elements, biological significance of Na, K, Mg, Ca, Fe, Co, Ni, Cu, Zn and chloride (Cl-). Toxic metal ions As, Hg & Pb Oxygen transport and storage – structure of hemoglobin, binding and transport of oxygen. Fixation of CO2 in photosynthesis- overview of light and dark reactions in photosynthesis. Structure of chlorophyll and coordination of magnesium. Electron transport in light reactions from water to NADP<sup>+</sup> (Z – scheme).

Unit – II (Organic Chemistry) S4-O-1: Carbohydrates

Introduction: Classification and nomenclature. Monosaccharides: All discussion to be confined to (+) glucose as an example of aldo hexoses and (-) fructose as example of ketohexoses. Chemical properties and structural elucidation: Evidences for straight chain pentahydroxy aldehyde structure.Number of optically active isomers possible for the structure, configuration of

15h (1hr/week) 6h

Your

11h

15h (1h/week)

glucose based on D-glyceraldehyde as primary standard (No proof for configuration is required). Evidence for cyclic structure of glucose (Pyranose structure, anomeric carbon and anomers). Proof for the ring size (methylation, hydrolysis and oxidation reactions). (Haworth formula and chair conformational formula). Structure of fructose: Evidence of 2 – ketohexose structure. Same osazone formation from glucose and fructose, Hydrogen bonding in osazones, cyclic structure for fructose (Furanose structure,Haworth formula).

Inter Conversion of Monosaccharides: : Arabinose to D-glucose, D- mannose (Kiliani – Fischer method). Epimers, Epimerisation - Lobry de bruyn van Ekenstein rearrangement. D-glucose to D-arabinose by Ruff's degradation. Aldohexose (+) (glucose) to ketohexose (-) (fructose) and Ketohexose (Fructose) to aldohexose (Glucose).

### S4-O-2: Amino acids and proteins

Classification. Methods of synthesis: General methods of synthesis of alpha amino acids (specific examples – Glycine, Alanine, Valine and Leucine by following methods: a) From halogenated Carboxylic acid b) Malonic ester synthesis c) Strecker's synthesis. Physical properties: Optical activity of naturally occurring amino acids. Zwitter ion structure – salt like character, definition of isoelectric point. Chemical properties: General reactions due to amino and carboxyl groups – Lactams from gamma and delta amino acids by heating peptide bond (amide linkage). Structure and nomenclature of peptides. Primary structure of proteins, dipeptide synthesis

### S4-O-3: Heterocyclic Compounds

Introduction and definition: 5 membered ring compounds with one hetero atom Ex. Furan. Thiophene and pyrrole. Importance of ring systems –Numbering. Aromatic character

Resonance structures: Explanation of feebly acidic character of pyrrole, electrophillic substitution, Halogenation, Nitration and Sulphonation. Reactivity of furan as 1,3-diene, Diels Alder reactions (one example). Sulphonation of thiophene purification of Benzene obtained from coal tar). Preparation of furan, Pyrrole and thiophene- Paul-Knorr synthesis. Structure of pyridine, Basicity – Aromaticity – Comparison with pyrrole – preparation by Hantsch method and properties – Reactivity towards Nucleophilic substitution reaction – Chichibabin reaction.

### Unit III (Physical Chemistry)

### S4-P-1: Chemical Kinetics

Introduction to chemical kinetics, rate of reaction, variation of concentration with time, rate laws and rate constant. Factors influencing reaction rates: effect of concentration of reactants, effect of temperature, effect of pressure, effect of reaction medium, effect of radiation, effect of catalyst with simple examples. Order of a reaction.

First order reaction, derivation of equation for rate constant. Characteristics of first order reaction. Units for rate constant. Half- life period, graph of first order reaction, Examples-Decomposition of  $H_2O_2$  and decomposition of oxalic acid, Problems.

Pseudo first order reaction, Hydrolysis of methyl acetate, inversion of cane sugar, problems. Second order reaction, derivation of expression for second order rate constant, examples-

15h (1hr/week)

### 11 h

5 h

4h

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Saponification of ester,  $2O_3 \rightarrow 3O_2$ ,  $C_2H_4+H_2 \rightarrow C_2H_6$ . Characteristics of second order reaction, units for rate constants, half- life period and second order plots. Problems

Zero order reaction: derivation of rate expression, examples i)combination of  $H_2$  and  $Cl_2$  to form HCl, ii) thermal decomposition of HI on gold surface characteristics of Zero order reaction units of k, half-life period and graph, problems. Determination of order of reaction: i) method of integration, ii) half life method, iii) Vant-Hoff differential method iv) Ostwald's isolation method. Kinetics of complex reactions (first order only): opposing reactions, parallel reactions, consecutive reactions and chain reactions (only brief discussion). Effect of temperature on reaction rate, Arrhenius equation. Temperature coefficient. Determination of energy of activation from Arrhenius equation and by graphical method, problems. Simple collision theory based on hard sphere model, explanation of frequency factor, orientation or steric factor. The transition state theory (elementary treatment).

### S4-P-2: Photochemistry

Introduction to photochemical reactions, Difference between thermal and photochemical reactions, Laws of photo chemistry- Grotthus Draper law, Stark–Einstein's Law of photochemical equivalence. Quantum yield. Examples of photo chemical reactions with different quantum yields. Photo chemical combinations of  $H_2$ –Cl<sub>2</sub> and  $H_2$ –Br<sub>2</sub> reactions, reasons for the high and low quantum yield. Problems based on quantum efficiency. Consequences of light absorption. Singlet and triplet states. Jablonski diagram. Explanation of internal conversion, inter- system crossing, phosphorescence, fluorescence.

### Unit IV (General Chemistry)

### S4-G-1: Theories of bonding in metals

Valence bond theory, Explanation of metallic properties and its limitations, Free electron theory, thermal and electrical conductivity of metals, limitations, Band theory, formation of bands, explanation of conductors, semiconductors n-type and p-type, extrinsic & intrinsic semiconductors and insulators.

### S4-G-2: Carbanions-II

Mannich reaction, Michael addition and Knoevengeal condensation Synthetic applications of Aceto acetic ester. Acid hydrolysis and ketonic hydrolysis: Preparation of ketones, monocarboxylic acids and dicarboxylic acids Malonic ester- synthetic applications. Preparation of (i) substituted mono carboxylic acids and (ii) substituted dicarboxylic acids.

### S4-G-3: Colloids & Surface Chemistry

Definition of colloids. Classification of colloids. Solids in liquids (sols): preparations and properties – Kinetic, Optical and Electrical stability of colloids. Protective action. Hardy–Schultz law, Gold number. Liquids in liquids (emulsions): Types of emulsions, preparation and emulsifier. Liquids in solids(gels): Classification, preparations and properties, General applications of colloids.

Adsorption: Types of adsorption. Factors influencing adsorption. Freundlich adsorption

4 h

15h (1hr/week)

5 h

### 6 h

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isotherm. Langmuir theory of unilayer adsorption isotherm. Applications.

### References

General reference: B.Sc II Year Chemistry : Semester IV, Telugu Academy publication, Hyd.

### Unit-I

- 1. Principles of Inorganic Chemistry by Puri, Sharma and Kalia, Vishal Publications (1996).
- 2. Concise Inorganic Chemistry by J.D. Lee 3rd Edition. Van Nostrand Reinhold Company (1977)
- 3. Basic Inorganic Chemistry by F.A.Cotton, G.Wilkinson and Paul.L. Gaus 3rd Edition, Wiley Publishers (2001).
- 4. Inorganic Chemistry Principles of structure and reactivity by James E.Huhey, E.A. Keiter and R.L. Keiter 4th Edition. (2006)
- 5. Chemistry of the elements by N. N. Greenwood and A. Earnshaw, Pergamon Press (1989).
- 6. Inorganic Chemistry by Shriver and Atkins, 3rd Edition, Oxford Press (1999).
- 7. Textbook of Inorganic Chemistry by R Gopalan, Universities Press, (2012).

### Unit-II

- 1. Text book of Organic Chemistry by Soni. Sultan Chand & Sons; Twenty Ninth Edition (2012)
- 2. General Organic Chemistry by Sachin Kumar Ghosh. New Age Publishers Pvt Ltd (2008)
- 3. Text book of Organic Chemistry by Morrison and Boyd. Pearson Publications (2009)
- 4. Text book of Organic Chemistry by Graham Solomons. Wiley Publications (2015)
- 5. Text book of Organic Chemistry by Bruice Yuranis Powla. (2012)
- 6. Text book of Organic Chemistry by C N pillai, CRC Press (2012)
- & Organic Chemistry by L. G. Wade Jr.
- 9. Organic Chemistry by M. Jones Jr.

10.Organic Chemistry by John McMurry.

### Unit III

- 1. Principles of physical chemistry by Prutton and Marron. The Macmillan Company; 4th Edition. (1970)
- 2. Text Book of Physical Chemistry by Soni and Dharmahara. Sulthan Chand & Sons.(2011)
- 3. Text Book of Physical Chemistry by Puri and Sharma. (2017)
- 4. Text Book of Physical Chemistry by K. L. Kapoor.(2012)
- 5. Physical Chemistry through problems by S.K. Dogra.(2015)
- 6. Text Book of Physical Chemistry by R.P. Verma.
- 7. Elements of Physical Chemistry by Lewis Glasstone. Macmillan(1966)
- 8. Industrial Electrochemistry, D. Pletcher, Chapman & Hall, London, 1990.

### Unit IV

- 1. Principles of Inorganic Chemistry by Puri, Sharma and Kalia, Vishal Publications (1996).
- 2. Concise Inorganic Chemistry by J. D. Lee 3<sup>rd</sup> Edition, Van Nostrand Reinhold Company (1977)
- 3. Basic Inorganic Chemistry by F.A.Cotton, G.Wilkinson and Paul.L. Gaus 3<sup>rd</sup> Edition,
- Wiley Publishers (2001). 4. Inorganic Chemistry Principles of structure and reactivity by James E.Huhey,
- E.A. Keiter and R.L. Keiter 4th edn. (2006). 5. Text book of Organic Chemistry by Morrison and Boyd, Pearson Publications (2009).

- 6. Text book of Organic Chemistry by Graham Solomons, Wiley Publications, (2015).
- 7. Organic synthesis by Dr. Jagadamba Singh and Dr. L. D. S. Yadav, Pragati Prakashan, 2010.
- 7. Organic chemistry by Clayden, Greeves, Warren and Wothers, Oxford University Press, 2001.
- 8. Colloids and Surface Chemistry, M. Satake, Y. Hayashi, Y. Mido. S. A. Iqbal and M. S. Sethi, Discovery Publishing Pvt Ltd., (2014).

### **Laboratory Course**

### Paper IV- Qualitative Analysis of Organic Compounds:

### 45hrs (3 h/week)

Qualitative analysis: Identification of organic compounds through the functional group analysis ignition test, Determination of melting points/boiling points, solubility test, functional group tests and preparation of suitable derivatives of the following: Carboxylic acids, phenols, amines, urea, thiourea, carbohydrates, aldehydes, ketones, amides, nitro hydrocarbons, ester and naphthalene.

### **References:**

- 1. Lab manual for UG students prepared by Department of Chemistry, University College for Women, Koti, Hyd.
- 2. Vogel's Text Book of Practical Organic Chemistry, Fifth Edition, Pearson's Education.
- 3. Practical Organic Chemistry by Mann and Saunders, 1974, Longmann Publications.

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 Dr. M.S. RADHIKA, Pho (Nurrition)

 बेजानिक ई (उप निरेशक) व किंगानाप्यस

 Science & A Head of the Department

 आहारविज्ञानविभाग, आईसीएमआर-राष्ट्रीयपोषणसंस्थान

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 Jamai-Osmania (PO), Secunderabad 500 007, TNDIA

M. Keesill

### B.Sc. Chemistry II Year Semester - IV Skill Enhancement Course- III (SEC - III) (2 Credits) Materials and their Applications

### Unit – I: Types of Materials

15 h (1hr/week)

Introduction: Materials and their importance. Classification of Materials, Advanced materials and their need. Types of Materials: Metals, ceramics, polymers and composites; Nature of bonding (Type of bond present). Types and applications of metal alloys: Classification- ferrous and non-ferrous alloys. Ferrous alloys -types and their applications. Non-ferrous alloys – Cu, Al, Ti alloys, their applications and super alloys.

Field Work- Collection of Metal Alloy Samples.

Types and Applications of Ceramics: Classification of Ceramics based on their applicationglasses, clay products, refractories, abrasives, cements, and advanced ceramics. Glasses: Compositions and Characteristics of Some of the Common Commercial Glasses; Properties and applications of glass ceramics - preparation of charts depicting various types of glass and their use. Clay products: Structural clay products and the white wares. Refractories: Compositions of four Common Ceramic Refractory Materials, fireclay, silica, basic refractories ex. MgO and special refractories ex. Alumina and Zirconia Cements: Classification, preparation of cement and the setting process; quick setting cements; applications.

Field Work-Visit to industries and collection of samples of materials

### **Unit – II:** Types of Polymers and Applications

### 15 h (1hr/week)

Classification of Polymeric materials based on application: Coatings, adhesives, films, foams with examples Polymer Additives: Fillers, Plasticizers, Stabilizers, Colorants, Flame Retardants with examples.

Advanced Materials: Types of advanced materials - semiconductors, bio-compatible materials, smart materials, advanced polymeric materials and nano-engineered materials. Biocompatible materials: Definition. Materials used as biomaterials and their properties. Metals and alloys used in bone and joint replacement. Filling and restoration materials – dental cements, dental amalgams, dental adhesives.

Field Work- Visit to Dental Clinics and interaction with Doctors regarding materials used in Dental treatments.

Smart materials: Shape memory alloys- definition and examples (Ni-Ti alloys, Cu based alloys), applications. Conducting polymers: - Introduction, Electrically conducting polymers and their uses (polyaniline, polypyrrole, polyacetylene and polythiophene).

### References

1. William D. Callister, Materials Science and Engineering An Introduction, John Wiley & Sons, Inc, 2006.

2. Material science by Kakani and Kakani.

3. Sujata V., Bhat., -Biomaterialsl, Narosa Publication House, New Delhi, 2002.

4.M. V. Gandhi and B. S. Thompson, —Smart Materials and Structuresl, Chapman and Hall, London,

First Edition, 1992.

5 Duerig, T. W., Melton, K. N, Stockel, D. and Wayman, C.M., —Engineering aspects of Shape memory Alloys, Butterworth – Heinemann, 1990.

6. Conducting Polymers, Fundamentals and Applications A Practical Approach Authors: Chandrasekhar, Prasanna Ashwin-Ushas Corp., Inc. Kluwer Academic Publishers. Boston

### B.Sc. Chemistry II Year Semester IV Skill Enhancement Course- IV (SEC - IV) (2 Credits) Chemistry of Cosmetics and Food Processing

### Unit-I: Chemistry of Cosmetics and Perfumes

A general study including preparation and uses of the following: Hair dye, hair spray, shampoo, sunscreen lotions, lipsticks, talcum powder, nail enamel, creams (cold, vanishing and shaving creams), antiperspirants and artificial flavours. Essential oils and their importance in cosmetic industries with reference to eugenol, geraniol, sandalwood oil, eucalyptus, 2-phenyl ethyl alcohol. Demonstration experiments or illustration of experimental procedures through charts for the preparation of talcum powder, shampoo and vanishing cream. Analysis of deodorants and antiperspirant - Aluminum, Zinc, Boric acid, Chloride and Sulphide.

### **Unit-II: Food Processing and Food Adulteration**

Food processing: Introduction, methods for food processing, additives and preservatives. Food processing- impact on nutrition, analysis of calcium in milk by complexometric titration, spectrophotometric analysis of iron in foods, Spectrophotometric identification and determination of caffeine and benzoic acid in soft drinks. Field Work -Visit to Food Industries. Food adulteration: Adulterants in some common food items and their identification: Pulses, chilli powder, turmeric powder, milk, honey, spices, food grains and wheat flour, coffee powder, tea leaves, vegetable oil, ghee, ice creams, tomato sauce. Field Work-Collection of adulterated food samples, demonstration of a minimum of five experiments for testing adulterants in food items.

### References

- 1. E. Stocchi: Industrial Chemistry, Vol -I, Ellis Horwood Ltd.UK.
- 2. P.C. Jain, M. Jain: Engineering Chemistry, Dhanpat Rai & Sons, Delhi.
- 3. Sharma, B.K. & Gaur, H. Industrial Chemistry, Goel Publishing House, Meerut(1996).
- 4. Rameen Devi, Food Processing and Impact on Nutrition, Sc J Agric Vet Sci.,
  - Aug-Sep2015; 2(4A):304-311.
- 5. W.A. Poucher, Perfumes, Cosmetics and Soaps (1993).
- 6. Srilakshmi, Food Science. Edition: 3rd (2004). 7. Lillian Hoagland Meyer, Food chemistry(2008).
- 8. Handbook of Analysis and Quality Control for Fruit and Vegetable Products, S. Ranganna, Tata
  - McGraw-Hill Education, 1986 Food.
- 9. Fundamental concepts of applied chemistry J.C Ghosh, S. Chand and Co, Ltd, New Delhi.
- 10. Applied Chemistry K. Bhagavathi Sundhar, MJP publishers.

### B.Sc. Chemistry III Year Semester –VI, BS 601 Optional for Chemistry Stream Advanced Chemistry - V

### Unit-I (Inorganic Chemistry) S6-O-I-1: Inorganic Reaction Mechanisms

Labile and inert complexes, Thermodynamic and kinetic stability, ligand substitution reactions –  $S_N^1$  and  $S_N^2$  in Octahedral complexes; substitution reactions of square planar complexes – Trans effect and applications of trans effect. Reactions of tetrahedral complexes - Hydrolysis of silicon halides (SiCl<sub>4</sub>) and phosphorous oxides (P<sub>2</sub>O<sub>5</sub>).

### **S6-O-I-2: Boranes and Carboranes:**

Definition of clusters. Structures of boranes and carboranes- Wade's rules, Closo  $(B_6H_6^{2-})$ , Nido  $(B_5H_9)$ , Arachno Boranes  $(B_4H_{10})$  and Carboranes  $(C_2B_{10}H_{12})$ .

### S6-O-I-3: Symmetry of molecules

Introduction, Symmetry operations and symmetry elements in molecules. Definition of Axis of symmetry types of  $C_n$ , Plane of symmetry ( $\sigma_h$ ,  $\sigma_v$ ,  $\sigma_d$ ), Centre of symmetry and Improper or Rotation-reflection axis of symmetry ( $S_n$ ). Explanation with examples.

### S6-O-I-4: Non – aqueous solvents

Classification and characteristics of a solvent. Reactions in liquid ammonia – physical properties, auto-ionisation, examples of ammono acids and ammono bases. Reactions in liquid ammonia – precipitation, neutralization, solvolysis, solvation - solutions of metals in ammonia, complex formation, redox reactions. Reactions in HF – auto-ionisation, reactions in HF – precipitation, acid – base reactions, protonation.

### Unit-II (Organic Chemistry)

S6-O-O-1: Pericyclic Reactions

Concerted reactions, Molecular orbitals of ethene,1,3-butadiene and allyl radical. Symmetry properties, HOMO, LUMO, Thermal and photochemical pericyclic reactions. Types of pericyclic reactions – electrocyclic, cycloaddition and sigmatropic reactions – one example each and their explanation by FMO theory.

### S6-O-O-2: Synthetic Strategies

Terminology – Target molecule (TM), Disconnection approach – Retrosynthesis, Symbol, Synthon, Synthetic equivalent (SE), Functional group interconversion (FGI), Linear and Convergent synthesis. Retrosynthetic analysis of the following molecules: 1) acetophenone 2) cyclohexene and 3) 2-phenylethanol.

### S6-O-O-3: Asymmetric synthesis

Definition and classification of stereoslective reactions: substrate, product stereoselective reactions, enantio and diastereo selective reactions. Stereospecific reaction – definition –example – dehalogenation of 1,2-dibromides induced by iodide ion. Enantoselective reactions – definition – example – Reduction of Ethylacetoacetate by Yeast. Diastereoselective reaction- definition-

60Hrs 15 Hrs

4h

**2 h** 

5 h

4 h

### 15 Hrs 5 h

### 5 h

example: Acid catalysed dehydration of 1-phenylproponal and Grignard addition to 2-phenyl propanal. Definition and explanation of enantiomeric excess and diastereomeric excess.

### Unit III (Physical Chemistry) S6-O-P--1: Polymers

Definition of polymers – natural polymers and synthetic polymers examples classification as plastics, fibers, elastomers.

Thermosetting, thermoplastic polymers. Branched, cross-linked and co-polymers.

Definition of polymerization - addition and condensation polymerization with examples. Explanation: chain polymerization, step polymerization, co-polymerization and co-ordination polymerization. Kinetics of free radical polymerization. Tacticity, atacticity, stereo specific synthesis- Zeigler- Natta catalyst.

Molecular weight definitions - number average and weight average molecular weight, Problems. Determination of molecular weight of polymers using viscosity method, Osmometric method.

Preparation and industrial applications of polyethylene, poly vinyl chloride (PVC), nylon -66, teflon, polyacrylonitrile and terelene.

Introduction to biodegradability and examples of biodegradable polymers.

### Unit IV: (General Chemistry)

### S6-O-G--1: Electroanalytical Methods

Types of Electroanalytical Methods.

I) Interfacial methods – a) Potentiometry: Principle, Electrochemical cell, Electrodes (i) Indicator and (ii) Reference electrodes – Normal Hydrogen Electrode, Quinhydrone Electrode, Saturated Calomel Electrode. Numerical Problems. Application of Potentiometry – Assay of Sulphanilamide

b) Voltammetry – three electrode assembly; Introduction to types of voltametric techniques, micro electrodes, Over potential and Polarization.

II) Bulk methods – Conductometry, Conductivity Cell, Specific Conductivity, Equivalent Conductivity. Numerical Problems. Applications of conductometry. Estimation of Cl – using AgNO<sub>3</sub>. Determination of Aspirin with KOH.

### **Recommended Text Books and Reference books:**

### Unit I

- 1. Concise Inorganic Chemistry by J. D. Lee, Third Edition, Van Nostrand Reinhold Company(1977)
- 2. Basic Inorganic Chemistry by F. A. Cotton, G. Wilkinson and Paul L. Gaus, Third Edition, Wiley Publishers (2001).
- 3. Inorganic Chemistry Principles of Structure and Reactivity by James E. Huhey, E.A. Keiter and R.L. Keiter, Fourth Edition, (2006)
- 4. Chemistry of the Elements by N. N. Greenwood and A. Earnshaw Pergamon Press (1989).
- 5. Inorganic Chemistry by Shriver and Atkins, Third Edition, Oxford Press (1999)

15 Hrs

15 Hrs

15 h

- 6. Principles of Inorganic Chemistry by Puri, Sharma and Kalia Vishal Publications (1996).
- 7. Group Theory and Spectroscopy by F. A. Cotton.
- 8. Textbook of Inorganic Chemistry by R Gopalan, Universities Press, (2012).

### Unit II

- 1. Text book of Organic Chemistry by Morrison and Boyd, Person(2009)
- 2. Text book of Organic Chemistry by Graham solomons, Wiley(2015)
- 3. Fundamentals of Organic Synthesis and Retrosynthetic analysis by Ratna Kumar Kar, NCBA,(2014)
- 4. Organic Synthesis by Dr. Jagadamba Singh and Dr. L. D. S. Yadav, Pragati Prakashan, 2010
- 5. Stereochemistry of Organic Compounds by D. Nasipuri, New Academic Science Limited, 2012
- 6. Organic Chemistry by Clayden, Greeves, Warren and Wothers, Oxford University Press, 2001.
- 7. Fundamentals of Asymmetric Synthesis by G. L. David Krupadanam, Universities Press(2014)

### Unit III

- 1. A Text book on 'Materials and their Applications', First Edition, Authors: Dr Mudvath Ravi,
- 2. Gopu Srinivas, Putta Venkat Reddy, Vuradi Ravi Kumar, Battini Ushaiah.
- 3. Materials Science and Engineering An Introduction by William D. Callister, Jr. John Wiley & Sons, Inc.
- 4. Material Science by Kakani and Kakani New Age International Pvt Ltd, 2004
- 5. Sujata V., Bhat., -Biomaterials, Narosa Publication House, New Delhi, 2002
- 6. M. V. Gandhi and B. S. Thompson, —Smart Materials and Structures, Chapman and Hall, London, First Edition, 1992.
- 7. Duerig, T. W., Melton, K. N, Stockel, D. and Wayman, C.M., —Engineering aspects of Shapememory Alloys||, Butterworth Heinemann, 1990.
- 8. Chandrasekhar, Prasanna Ashwin-Ushas Conducting Polymers, Fundamentals and Applications A Practical Approach Authors: Corp., Inc. Kluwer Academic Publishers. Boston.

### Unit IV

- 1. D. A. Skoog, F. J. Holler, T. A. Nieman, Principles of Instrumental Analysis, Engage earning India Ed.
- 2. D. A. Skoog, D. M. West, F. J. Holler, Fundamentals of Analytical Chemistry, Sixth Edition, Saunders College Publishing, Fort worth (1992).
- Willard, H. H., Merritt, L. L., Dean, J. & Settoe, F. A. Instrumental Methods of Analysis. 7<sup>th</sup> Edition. Wadsworth Publishing Co. Ltd., Belmont, California, USA, 1988.
- 4. Harris, D. C. Quantitative Chemical Analysis, W. H. Freeman. 2007.
- 5. Dean, J. A. Analytical Chemistry Notebook, McGraw Hill.
- 6. Analytical Chemistry 7th Edition by Gary D. Christian (2004).

### B.Sc. Chemistry III Year Semester-VI, BS 606 Discipline Centric Elective-A (4 Credits) Medicinal Chemistry

Unit- I: Drugs

15Hrs

60Hrs

15Hrs

S6-E-A-I: Diseases: Common diseases, infective diseases-insect borne, air-borne, water-borne and hereditary diseases.

**Terminology**: Drug, Active Pharmaceutical Ingredient (API), Pharmacy, Pharmacology, Pharmacophore, Pharmacodynamics, Pharmacokinetics, metabolites, anti-metabolites and therapeutic index.

**Drugs**: Nomenclature: Chemical name, Generic name and Trade names with examples; **Classification**: Classification based on structures and therapeutic activity with one example each.

**ADME:** a) Absorption: Definition, absorption of drugs across the membrane – active and passive absorption, routes of administration of drugs. b) Distribution: definition and effect of plasma protein binding. c) Metabolism: definition, phase I and phase II reactions. d) Elimination: definition and renal elimination.

### **Unit-II: Enzymes and Receptors**

**S6-E-A-II: Enzymes: Introduction.** Mechanism and factors affecting enzyme action, Specificity of enzyme action (including stereo specificity), Enzyme inhibitors and their importance – Kinetic and enzymatic catalysis (Michaelis-Menten Law). Types of inhibition - reversible, irreversible and their subtypes with examples.

**Receptors:** Introduction, Drug action-receptor theory, Mechanism of drug action, concept of agonists and antagonists with examples. Drug receptor interactions involved in drug receptor complex. binding role of -OH group,  $-NH_2$  group, quaternary ammonium salts and double bond. Structure – activity relationships of drug molecules, explanation with sulfonamides.

Unit- III: Synthesis and Therapeutic Activity of Drugs15HrsS6-E-A-III: Introduction, synthesis and therapeutic activity of:<br/>Chemotherapeutics: Sulphanilamide, dapsone, Pencillin-G (semi synthesis), Chloroquin,<br/>Isoniazid, Cisplatin and AZT.

**Drugs to treat metabolic disorders: Anti diabetic -** Tolbutamide; Anti-inflammatiory – Ibuprofen; Cardiovascular- Glyceryl trinitrate; Antipyretic (paracetamol, aspirin) and Antacid-Omeprazole.

**Drugs acting on nervous system:** Anaesthetics-definition, Classification-local and general. Volatile - Nitrous oxide, chloroform. Local anaesthetics – benzocaine, side effects.

### Unit- IV: Molecular Messengers and Health Promoting Drugs

15Hrs

**S6-E-A-IV: Molecular Messengers:** Introduction to hormones and neurotransmitters, Thyroid hormones, Antithyroid drug - Carbimazol. Adrenaline: Adrenergic drugs- salbutamol, atenelol. Serotonin: SSRIs- fluoxetine. Dopamine: Anti-parkinson drug- Levodopa.

Vitamins and Micronutrients: Introduction, vitamins sources, Deficiency disorders and remedy of Vitamins A, B, C, D, E and K and micronutrients – Na, K, Ca, Cu, Zn and I.

### **Recommended Text Books and Reference books**

- 1. G.L. Patrick: Introduction to Medicinal Chemistry, Oxford University Press, New York. 2013.
- 2. Thomas Nogrady, Medicinal Chemistry, Oxford Univ. Press, New York.2005.
- 3. David William and Thomas Lemke, Foye's Principles of Medicinal Chemistry, Lippincott Williams & Wilkins, 2008.
- 4. Ashutosh Kar Medicinal Chemistry, New Age International, 2005.
- 5. O. D. Tyagi & M. Yadav Synthetic Drugs by, Anmol Publications, 1998.
- 6. Medicinal Chemistry by Alka L. Gupta, Pragati Prakashan.
- 7. G. L. David Krupadanam, D. Vijaya Prasad, K. Varaprasad Rao, K. L. N. Reddy, C. Sudhakar, Drugs, Universities Press (India) Ltd. 2012.

डॉ.एम.एस. राधिका, वीएवडी (पोषण) Dr. M.S. RADHIKA, PhD (Nutr वैज्ञानिक-ई (उप निदेशक) व विभागाध्यक्ष nce-E & Head of the Department आहारविज्ञानविभाग, आईसीएमआर-राष्ट्रीयपोषणसंस्थान Department of Dietetics, ICMR-National Institute of Nutrition जामे-उस्मानिया (पोस्ट), सिकदराबाद-४००० ००७, भारत Jamai Osmania (PO), Secunderabad 500.007 INDIA

### **B.Sc. Chemistry III Year** Semester –VI, BS 606 **Discipline Centric Elective-B (4 Credits)** Agricultural and Fuel Chemistry

Unit I: - Pesticides

60 Hrs

15Hrs

S6-E-B-I: Introduction, Definition, classification of pesticides based on use (target). Toxicity and chemical structure with examples. Adverse effects of pesticides and its impact on environmental pollution.

Synthesis, technical manufacture and uses of representative pesticides in the following classes: Organochlorines (Cypermethrin); Organophosphates (Parathion); Carbamates (carbaryl); Quinones (Chloranil), Anilides (Alachlor).

Pesticide formulations: Dusts, Granules, Wettable powders, Emulsions and Aerosols.

Biopestcides : Introduction: Potential pesticidal plants of India, Role of Neem in plant protection-constituents, Azadirachtin and its role in pest control, Structure and mode of action of Pyrethrins( pyrethrin-1) and Pyrethroids (permethrin) and nicotinoids (Imidacloprid).

### Unit II: - Fertilizers

### 15Hrs

S6-E-B-II: Introduction: (need of fertilizers), functions of essential plant nutrients (N, P, K), Classification formula and uses of fertilizers:

Nitrogenous fertilizers: Ammonium nitrate, Urea, Calcium Cyanamide, Calcium Ammonium Nitrate, Sodium Nitrate, Ammonium Chloride and their uses.

Phosphate fertilizers: Normal super phosphate, Triple Super Phosphate, Ammonium Phosphate and their uses.

Potassium fertilizers: Potassium chloride, potassium nitrate, potassium sulphate and uses. Complex fertilisers: Diaammonium Phosphate and mixed fertilizers their uses. Manufacture of urea and Super phosphate of lime and their reactions in the soil.

Biofertilizers - Introduction, definition, classification, Rhizobium, Azatobactor, Azospirillium, Azolla, Blue Green Algae, Vermicomposting and uses.

Organic farming: The principal methods, crop rotation, green manures and compost, biological pest control, and mechanical cultivation and uses.

### Unit III: Energy Sources and Coal

S6-E-B-III: Review of energy sources (renewable and non-renewable). Classification of fuels and their calorific value.

Coal: Uses of coal (fuel and nonfuel) in various industries, its composition, carbonization of coal. Coal gas, producer gas and water gas-composition and uses. Fractionation of coal tar, uses of coal tar bases chemicals, requisites of a good metallurgical coke, Coal gasification (Hydro gasification and Catalytic gasification), Coal liquefaction and Solvent Refining.

### Unit IV: Petroleum, Petrochemical Industry and Lubricants

S6-E-B-IV: Petroleum and Petrochemical Industry: Composition of crude petroleum, Refining and different types of petroleum products and their applications.

Fractional Distillation - Principle and process, Cracking -Thermal and catalytic cracking, Reforming of Petroleum and non-petroleum fuels (LPG, CNG, LNG, bio-gas, fuels derived from biomass), fuel from waste, synthetic fuels (gaseous and liquids), clean fuels.

15Hrs.

15Hrs.

Petrochemicals: Vinyl acetate, Propylene oxide, Isoprene and their uses.

Lubricants: Classification of lubricants, Properties and functions of lubricants (viscosity index, cloud point, pour point) and their determination. Lubricating oils (conducting and non-conducting) Solid and semisolid lubricants, synthetic lubricants.

### **Recommended Text Books and Reference books**

- 1. N. N. Melnikov, Chemistry of pesticides; Springer-Verlag- Technology & Engineering (2012).
- 2. Thomas A. Unger Pesticide Synthesis Handbook; Elsevier, (2000).
- 3. R. Cremlyn Pesticides; John Wiley, 1980.
- 4. K. Kolay Manures and Fetrtilisers; Published by Atlantic (2007).
- 5. Stocchi, E. Industrial Chemistry, Vol-I, Ellis Horwood Ltd. UK (1990).
- 6. Jain, P.C. & Jain, M. Engineering Chemistry Dhanpat Rai & Sons, Delhi.
- 7. Sharma, B.K. & Gaur, H. Industrial Chemistry, Goel Publishing House, Meerut (1996).

डॉ.एम.एस. राधिका, पीएवडी (पोषण) pr. M.S. RADHIKA, PhD (Nutrition) वैज्ञातिकर्न् (उप लिश्वरक) व विभाजाप्यस Science-E & Head of the Department आहारविज्ञानविभाग, आईसीएनआप-राष्ट्रीयपोषणसंस्थान Department of Dietetics, ICMR-National Institute of Nutrition जानेउस्माविधा (पोस्ट), सिकदराबाद-४००० (०७, भारत Jama-Osmania (PO), Secunderabad-500 007, Mixiya



M. Kawid

### Semester - VI Laboratory Course - VI Experiments in Physical Chemistry - II

### **Physical Chemistry**

45h (3 h/w)

### 1. Kinetics

- a) Determination of specific reaction rate of the hydrolysis of methyl acetate catalyzed by hydrogen ion at room temperature.
- b) Determination of rate of decomposition of hydrogen peroxide catalyzed by FeCl<sub>3</sub>.

### 2. Electrochemistry

### A. Potentiometry:

- a) Potentiometric titration of strong acid (HCl) vs. strong base (NaOH) Determination of the concentration of the given acid.
- b) Potentiometric titration of weak acid (CH<sub>3</sub>COOH) vs. strong base (NaOH) Determination of the concentration of the given acid.
- c) Determination of redox potential of  $Fe^{2+}/Fe^{3+}$  by potentiometric titration of ferrous ammonium sulphate vs. potassium dichromate.
- d) Precipitation titration of KCl vs. AgNO<sub>3</sub> -Determination of given concentration of silver nitrate.

### B. pH metry:

- b) pH metric titration of strong acid (HCl) vs. strong base (NaOH) Determination of the concentration of the given acid.
- c) pH metric titration of weak acid (acetic acid) with strong base (NaOH) Determination of acid dissociation constant (Ka) of weak acid.

### 3. Conductometry:

a) Determination of overall order: Saponification of ethyl acetate with NaOH by conductance measurements.



डॉ.एम.एस. राधिका, पीएवर्डा (पोषण) Dr. M.S. RADHIKA, PhD (Nutrition) वेलालेकर्स (उप क्रिरेशक) व विभागाय्यम Science: & Head of the Department आहारविज्ञानविभाग, आईसीएमआर-राष्ट्रीयपोषणसंस्थान Department of Dietetics, ICMR-National Institute of Nutrition जमेउस्मालिया (पोस्ट), सिक्टराबाद-४००० ००७, १४२७ Jamai-Osmania (PO), Secunderabaa 500 007 IND'A

### B.Sc. CBCS CHEMISTRY Theory Model Question Paper For Semester I, II, III, IV

Time :3Hrs.

Max. Marks : 80

Note: Answer eight questions from Part-A and all questions from Part-B. Each question carries 4 marks in Part-A and 12 marks in Part-B.

	Part-A	(8 x 4 = 32 Marks)
	(Short Answer Type)	
I. Write any Eight questions o	f the following	
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12.	Devet D	( 4 x 12 = 48 Marks)
	Fart-D (Faray Answer Type)	$(4 \times 12 - 40 \text{ Walks})$
H Answer all Questions	(Essay Answer Type)	· ·
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	the second	डा.एम.एस. राधिका, पीएचडी (पोषण) Dr. M.S. RADHUK ?
•	1- Male	वैज्ञानिक-इं (उप निदेशक) व विभावगर्रास Science-E & Head of the Dearer
W- M. keani	2.	आहारविज्ञानविभाग, आईसीएमआर-राष्ट्रीयपोषणसंस Department of Dietetics, ICMR-National Institution
Appar	V	जामे-उस्मानिया (पोस्ट), सिकंदराबाद १००० ००७, भारत Jamai-Osmania (PO), Secunderabad-500 ००२
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### B.Sc. CBCS CHEMISTRY Practical Model Question Paper For Semester I, II, III, IV

Max. Marks :50

		I to al (Marks)	Total (Marks)
CEMESTER	External (Marks)	Internal (Marks)	
SEMESTER	40	10	50
I	40	10	50
Π	40	10	50
TTT	40	10	50
111	40	10	50
IV	40		

 छा.एम.एस. राधिका, वीएचडी (पोषण)
 Dr. M.S. RADHIKA, PID (Nutrition) वैज्ञानिकःई (उप निदेशन) व विभानप्रथक Science-ह-महिब्ब of the Department आहार्टविज्ञानविभाग, आईसीएमआर-राष्ट्रीयपोषणसंस्थान Department of Diotetics, ICMR-National Institute of Nutrition जमेन्द्रज्जनिया (पोस्ट), सिकदराबाद-१००० २०७, भारत Jamai-Osmania (PO), Secundersbard 400 007, 100 A M. Kamille

Time :3Hrs.

### Telangana State Council of Higher Education, Govt. of Telangana B.Sc., CBCS Common Core Syllabi for all Universities in Telangana PROPOSED SCHEME FOR CHOICE BASED CREDIT SYSTEM IN Head B.Sc. Chemistry from 2021-2022 Department of Chemistry FIRST YEAR- SEMESTER I University College for Washe Kou, Hyderabad-95. COURSE **COURSE TITLE** CODE TYPE 2 ES **BS 101** Ability Enhancement Compulsory Course AECC-1 4 4 CC-1A **BS 102** English 4 CC-2A **BS 103** Second language 4 + 1 = 54T+3P=7 DSC-1A **BS 104 Optional** I 4+1=54T+3P=7 DSC-2A **BS 105 Optional II** 4 **4**T **BS 106 Optional III- Chemistry - I** =5 = 7 DSC-3A Laboratory Course - I 3P 1 (Qualitative Analysis - Semi Micro Analysis of Mixtures) 25 31 **Total Credits FIRST YEAR- SEMSTER II** 2 2 BCS Ability Enhancement Compulsory Course AECC-2 .... **BS 201** 4 4 CC-1B **BS 202** English 4 4 CC-2B **BS 203** Second language 4+1=54T+3P=7DSC-1B **Optional** I **BS 204** 4T+3P=7 4+1=5DSC-2B **Optional II BS 205 Optional III- Chemistry - II BS 206 DSC-3B 4T** Laboratory Course - II =5 = 7 (Quantitative Analysis – Titrations) 3P 1 31 25 **Total Credits SECOND YEAR- SEMSTER III** 2 2 SEC-1 i) Safety Rules in Chemistry Laboratory and Lab Reagents BS 301 2 2 ii) Remedial methods for pollution, drinking water SEC-2 and Soil fertility CC-1C 3 3 English **BS 302** CC-2C 3 Second language **BS 303** 4T + 3P = 7DSC-1C 4+1=5**Optional** I **BS 304** DSC-2C 4T+3P=7 4+1=5**Optional II BS 305 Optional III-** Chemistry - III **BS 306** Laboratory Course - III **4T** 4 (Synthesis of Organic compounds ) DSC-3C =5 = 7 3P 1 **Total Credits** 31 25 **SECOND YEAR- SEMSTER IV** i) Materials and their Applications 2 2 222 SEC-3 BS 401 ii) Chemistry of Cosmetics and Food Processing SEC-4 3 CC-1D 3 English BS 402 CC-2D Second language 3 BS 403 Optional I DSC-1D 4T + 3P = 74+1=5**BS 404** DSC-2D **Optional II** 4T + 3P = 74 + 1 = 5**BS 405 Optional III- Chemistry - IV 4T BS 406** 4 Laboratory Course - IV DSC-3D = 7 (Qualitative Analysis of Organic Compounds) 3P 1 **Total Credits** 31 25 AECC: Ability Enhancement Compulsory Course, SEC: Skill Enhancement Course, DSC: Discipline Specific Course, GE; Generic Elective, ES: Environmental Science, BCS : Basic co nouter skills.

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B. Sc. Chemistry, III year, CBCS Syllabus

### Telangana State Council of Higher Education, Govt. of Telangana, B.Sc. CBCS Common Core Syllabus for all Universities in Telangana

B. Sc. Chemistry (For the batch admitted in 2019-2020)

	THIRD YEAR - SEN	MESTER V		
CODE	COURSE TITLE	COURSE TYPE	HPW	CREDITS
BS 501	Chemistry of Cosmetics, Food Processing, Drugs and Pharmaceuticals	GE	4	4
BS 502	English	CC-1E	3	3
BS 503	Second language	CC-2E	3	3
BS 504	Ontional - I A/B	DSE -IE		4+1=5
BS 505	Optional - II A/B	DSE -2E		4+1=5
BS 506	Ontional- III A/B			
25 500	A. Spectroscopy and Chromatography (or) B. Metallurgy, Dyes and Catalysis	DSE -3E	4T and 3P = 7	4 = 5
	Laboratory Course -V			1
	TOTAL			25
BS 601	Project in Chemistry/ Advanced Chemistry			4
BS 602	English	cc-lF	3	
BS 603	Second language	CC-2F	3	3
BS 604	Optional - I A/B	DSE-IF		4+1=5
BS 605	Optional - II A/B	DSE -2F		4+1=5
BS 606	Optional- III A/B	DSE -3F		
	A. Medicinal Chemistry		41	4
	(or) D. Agricultural and Fuel Chemistry		= 7 3P	= 5
	Laboratory Course -VI		51	•
	Experiments in Physical Chemistry-II			
	тоты			25
	TOTAL			25
	IOTAL Credits			150
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डॉ.एम.एस. राधिका, पीएचडी (पोचन) Dr. M.S. RADHIKA, PhD (Notation) वैकाणिकर्नु (उव क्रिवेशक) व विभागस्थत Science & 8 Head of the Department Science & 8 Head of the Department **Science & 8 Head of the Department organizational content organizational content** 

### **B. Sc. I Yr CHEMISTRY** SEMESTER WISE SYLLABUS SEMESTER I

### (For the batch admitted in 2021-2022) onwards

### Paper - I

### Chemistry - I

### **Unit-I (Inorganic Chemistry)** S1- I-1: Chemical Bonding

Ionic solids - lattice and solvation energy, solubility of ionic solids, Fajan's rule, polarity and polarizability of ions. VSPER Theory - Common hybridization-sp, sp<sup>2</sup>, sp<sup>3</sup>, sp<sup>3</sup>d, sp<sup>3</sup>d<sup>2</sup> and sp<sup>3</sup>d<sup>3</sup>, shapes of molecules. Molecular orbital theory: Shapes and sign convention of atomic overlapping.  $\sigma$  and  $\pi$  orbitals. Modes of bonds. Criteria for orbital overlap. LCAO concept. Concept of Types of molecular orbitals - bonding, anti-bonding and non-bonding. MOED of homonuclear diatomics - H<sub>2</sub>, N<sub>2</sub>, O<sub>2</sub><sup>-</sup>, O<sub>2</sub><sup>2-</sup>, F<sub>2</sub> (unhybridized diagrams only) and heteronuclear diatomics CO, CN<sup>-</sup>, NO, NO<sup>+</sup> and HF. Bond order, stability and magnetic properties.

### S1-I-2: p-block elements - I

Group-13: Structure of diborane and higher Boranes (B4H10 and B5H9), Boron nitrogen compounds (B<sub>3</sub>N<sub>3</sub>H<sub>6</sub> and BN), Lewis acid nature of BX<sub>3</sub>.

Group - 14: Carbides - Classification - ionic, covalent, interstitial -Structures and reactivity. Industrial applications. Silicones - Classification - straight chain, cyclic and cross-linked.

Group - 15: Nitrides - Classification - ionic, covalent and interstitial. Reactivity - hydrolysis. Reactions of hydrazine, hydroxyl amine, phosphazenes.

### Unit – II (Organic Chemistry)

### S1-O-1: Structural Theory in Organic Chemistry

Bond polarization: Factors influencing the polarization of covalent bonds, Electronegativity -Inductive effect. Application of inductive effect (a) Basicity of amines (b) Acidity of carboxylic acids (c) Stability of carbonium ions. Resonance - Mesomeric effect, application to (a) Acidity of phenol. (b) Acidity of carboxylic acids and Basicity of anilines. Hyper conjugation and its application to stability of carbonium ions, free radicals and alkenes.

### S1-O-2: Acyclic Hydrocarbons

Alkanes - Nomenclature, Methods of preparation: From Grignard reagent, Kolbe synthesis. Chemical reactivity - inert nature, free radical substitution, Halogenation example- reactivity. selectivity and orientation.

Alkenes - Nomenclature, Preparation of alkenes (with mechanism) (a) by dehydration of alcohols (b) dehydrohalogenation of alkyl halides (c) by dehalogenation of 1,2 dihalides. Zaitsev's rule. Properties: Anti-addition of halogen and its mechanism. Addition of HX. Markonikov's rule, addition of H2O, HOX, H2SO4 with mechanism and addition of HBr in the

### 15h (1 hr/week)

### 6 h

5 h

### 15 h (1hr/week) 8 h

presence of peroxide (anti-Markonikov's addition), Oxidation (cis-additions)-hydroxylation by KMnO4, OsO4, anti addition- peracids (via epoxidation), hydroboration, ozonolysis - location of double bond. Dienes - Types of dienes, reactions of conjugated dienes - 1,2 and 1,4 addition of HBr to 1,3 – butadiene and Diels – Alder reaction.

Alkynes- Preparation by dehydrohalogenation of vicinal dihalides, dehalogenation of tetrahalides. Physical Properties: Chemical reactivity - electrophilic addition of X2, HX, H2O (tautomerism), Oxidation (formation of enediol, 1,2 diones and carboxylic acids) and reduction (Metal-ammonia reduction, catalytic hydrogenation), polymerization of acetylene.

### **Aromatic Hydrocarbons**

Introduction to aromaticity: Huckel's rule - Benzene, Naphthalene and Anthracene. Reactions -General mechanism of electrophilic substitution, mechanism of nitration, sulphonation and halogenation, Friedel Craft's alkylation and acylation. Orientation of aromatic substitution -Definition of ortho, para, and meta directing groups. Ring activating and deactivating groups with examples. Orientation - (i) activating groups: Amino, methoxy and alkyl groups (ii) Deactivating groups - nitro, nitrile, carbonyl, carboxylic acid, sulphonic acid and halo groups.

### **Unit – III (Physical Chemistry)**

### S1-P-1: Atomic Structure and Elementary Quantum Mechanics

Black body radiation, Planck's radiation law, photoelectric effect, Limitations of classical mechanics, Compton effect, de Broglie's hypothesis. Heisenberg's uncertainty principle. Schrodinger's wave equation and its importance. Physical interpretation of the wave function, significance of  $\psi$  and  $\psi^2$ .

### S1-P-2: Gaseous State

Deviation of real gases from ideal behavior. Vander Waals equation of state. Critical phenomenon. PV isotherms of real gases, continuity of state. Andrew's isotherms of CO<sub>2</sub>. The Vander Waal's equation and critical state. Derivation of relationship between critical constants and Vander Waal's constants. The law of corresponding states, reduced equation of states. Joule Thomson effect and inversion temperature of a gas. Liquefaction of gases: i) Linde's method based on Joule Thomson effect ii) Claude's method based on adiabatic expansion of a gas.

### S1-P-3: Liquid State and Solutions

### **Liquid State**

Intermolecular forces, structure of liquids (qualitative description). Structural differences between solids, liquids and gases. Surface tension and its determination using stalagmometer. Viscosity of a liquid and determination of coefficient of viscosity using Ostwald viscometer. Effect of temperature on surface tension and coefficient of viscosity of a liquid (qualitative treatment only). Liquid crystals, the mesomorphic state: Classification of liquid crystals into Smectic and Nematic, Application of liquid crystals

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4h

15h (1 hr/week)

### 5h

### 4h

### **Solutions**

Liquid - liquid mixtures, ideal liquid mixtures, Raoult's and Henry's laws. Non ideal systems. Azeotropes: HCl-H<sub>2</sub>O and C<sub>2</sub>H<sub>5</sub>OH - H<sub>2</sub>O systems. Fractional distillation. Partially miscible liquids: Phenol – Water, Trimethyl amine – Water and Nicotine – Water systems.

### Unit – IV (General Chemistry)

### S1-G-1: General Principles of Inorganic Qualitative Analysis

Anion analysis: Theory of sodium carbonate extract, classification and reactions of anions- $CO_3^{2-}$ ,  $Cl^-$ ,  $Br^-$ ,  $SO_4^{2-}$ ,  $PO_4^{3-}$ ,  $BO_3^{3-}$ ,  $CH_3COO-$ ,  $NO_3^-$ . Interfering ions. Cation Analysis: Principles involved - Solubility product, common ion effect, general discussion for the separation and identification of group I individual cations  $(Hg_2^{2^+}, Ag^+, Pb^{2^+})$  with flow chart and chemical equations. Principle involved in separation of group II & IV cations. General discussion for the separation and identification of group II  $(Hg^{2+}, Pb^{2+}, Bi^{3+}, Cd^{2+}, Sb^{3+})$ , III  $(Al^{3+}, Fe^{3+})$ , IV  $(Mn^{2+}, Zn^{2+})$  individual cations with flow chart and chemical equations. Hydrolysis concept for the precipitation of Group V cations. General discussion for the separation and identification of group V individual cations  $(Ba^{2+}, Sr^{2+}, Ca^{2+})$  with flow chart and chemical equations. Theory of flame test. Identification of Group VI cations  $(Mg^{2+}, NH_4^+)$ 

### S1-G-2: Isomerism

Isomerism: Definition of isomers. Classification of isomers: Constitutional and Stereoisomers definition and examples. Constitutional isomers: chain, functional and positional isomers. Stereoisomers: enantiomers and diastereomers - definitions and examples. Representation of stereoisomers - Wedge, Fischer projection, Sawhorse, Newmann formulae.

Conformational analysis: Conformational analysis of ethane, n-butane, 1,2- dichloroethane, 2chloroethanol. Cyclic compounds: Baeyer's strain theory, Conformational analysis of cyclohexane, Cis-trans isomerism: E-Z-Nomenclature

### S1-G-3: Solid State Chemistry

Laws of Crystallography: (i) Law of Constancy of interfacial angles (ii) Law of Symmetry-Symmetry elements in crystals (iii) Law of rationality of indices. Definition of space lattice, unit cell. Bravais Lattices and Seven Crystal systems (a brief review). X-ray diffraction by crystals; Derivation of Bragg's equation. Determination of structure of NaCl, KCl and CsCl (Bragg's method and Powder method).

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### 6h

15h (1 hr/week)

4h

### References

General reference: B.Sc I Year Chemistry: Semester I, Telugu Academy publication, Hyderabad.

### Unit- I

- 1. Principles of Inorganic Chemistry by Puri, Sharma and Kalia Vishal Publications1996.
- 2. Concise Inorganic Chemistry by J.D. Lee Third Edition.
- 3. Basic Inorganic Chemistry by F.A.Cotton, G.Wilkinson and Paul.L. Gaus 3<sup>rd</sup> Edition, Wiley Publishers 2001.Chem.
- 4. Inorganic Chemistry Principles of structure and reactivity by James E. Huhey, E. A. Keiter and R. L. Keiter 4<sup>th</sup> Edition.
- 5. Chemistry of the Elements by N. N. Greenwood and A. Earnshaw, Pergamon Press 1989.
- 6. Inorganic Chemistry by Shriver and Atkins 3<sup>rd</sup> Edition, Oxford Press, 1999.
- 7. Textbook of Inorganic Chemistry by R Gopalan.

### Unit- II

- 1. Organic Chemistry by Morrison and Boyd.
- 2. Organic Chemistry by Graham Solomons.
- 3. Organic Chemistry by Bruice Yuranis Powla.
- 4. Organic Chemistry by L. G. Wade Jr.
- 5. Organic Chemistry by M. Jones Jr
- 6. Organic Chemistry by John McMurry.
- 7. Organic Chemistry by Soni.
- 8. General Organic chemistry by Sachin Kumar Ghosh.
- 9. Organic Chemistry by C N Pillai

### Unit III

- 1. Principles of physical chemistry by Prutton and Marron.
- 2. Text Book of Physical Chemistry by Soni and Dharmahara..
- 3. Text Book of Physical Chemistry by Puri and Sharma.
- 4. Text Book of Physical Chemistry by K. L. Kapoor.
- 5. Physical Chemistry through problems by S. K. Dogra.
- 6. Text Book of Physical Chemistry by R. P. Verma.
- 7. Elements of Physical Chemistry by Lewis Glasstone.

### Unit IV

- 1. Qualitative analysis by Welcher and Hahn.
- 2. Vogel's Qualitative Inorganic Analysis by Svehla.
- 3. Text Book of Organic Chemistry by Morrison and Boyd.
- 4. Text Book of Organic Chemistry by Graham Solomons.
- 5. Text Book of Organic Chemistry by Bruice Yuranis Powla.
- 6. Text Book of Organic Chemistry by Soni.
- 7. Text Book of Physical Chemistry by Soni and Dharmahara..
- 8. Text Book of Physical Chemistry by Puri and Sharma.
- 9. Text Book of Physical Chemistry by K. L. Kapoor.

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# Laboratory Course

## 45h (3 h /week)

# Paper I - Qualitative Analysis - Semi Micro Analysis of Mixtures

Analysis of two anions (one simple and one interfering) and two cations in the given mixture.

Anions: CO3<sup>2-</sup>, SO3<sup>2-</sup>, S<sup>2-</sup>, Cl<sup>-</sup>, Br<sup>-</sup>, I<sup>-</sup>, CH3COO<sup>-</sup>, NO3<sup>-</sup>, PO4<sup>3-</sup>, BO3<sup>3-</sup>, SO4<sup>2-</sup>

Cations: Hg2<sup>2+</sup>, Ag<sup>+</sup>, Pb<sup>2+</sup>

 $Hg^{2+}$ ,  $Pb^{2+}$ ,  $Bi^{3+}$ ,  $Cd^{2+}$ ,  $Cu^{2+}$ ,  $As^{3+/5+}$ ,  $Sb^{3+/5+}$ ,  $Sn^{2+/4+}$ 

Al<sup>3+</sup>, Cr<sup>3+</sup>, Fe<sup>3+</sup>

Zn<sup>2+</sup>, Ni<sup>2+</sup>, Co<sup>2+</sup>, Mn<sup>2+</sup>

Ba<sup>2+</sup>, Sr<sup>2+</sup>, Ca<sup>2+</sup>

Mg<sup>2+</sup>, NH4<sup>+</sup>

### **References:**

- -Lab Manual for UG students prepared by Department of Chemistry, University College for Women, Koti, Hyd.
- Qualitative analysis by Welcher and Hahn. Vogel's Qualitative Inorganic Analysis by Svehla.
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### (For the batch admitted in 2020-2021) onwards SEMESTER WISE SYLLABUS **B.Sc II Yr CHEMISTRY** Ξ SEMESTER

### Chemistry - III Paper-III

# Unit-I (Inorganic Chemistry)

### 15 h (1hr/week)

# S3-I-1: Chemistry of f-block elements:

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Chemistry of Lanthanides: Position in periodic table, Electronic structure, oxidation state, ionic and atomic radii- lanthanide contraction- cause and consequences, anomalous behavior of post paramagnetism. Colour and spectra, f-f transitions - occurrence and separation - ion exchange preferred. Magnetic properties of donor ligands - type complexation method, solvent extraction. lanthanides

Chemistry of actinides- general features - electronic configuration, oxidation state, actinide contraction, colour and complex formation. Comparison with lanthanides.

6 h

# S3-I-2: Coordination Compounds-I

Simple inorganic molecules and coordination complexes. Nomenclature – IUPAC rules,

 Coordination number, coordination geometries of metal ions, types of ligands.
 Brief review of Werner's theory, Sidgwick's electronic interpretation and EAN rule and their , [CoF6]3-Limitations of VBT. complexes [Ni(NH<sub>3</sub>)<sub>4</sub>]<sup>2+</sup>, [Cu(NH<sub>3</sub>)<sub>4</sub>]<sup>2+</sup>, [ [Co(NH<sub>3</sub>)<sub>6</sub>]<sup>3+</sup>, [C limitations.

Square planar metal complexes of the type[MA<sub>2</sub>B2], [MA<sub>2</sub>BC], [M(AB)<sub>2</sub>], [MABCD]. (ii) Octahedral metal complexes of the type [MA<sub>4</sub>B<sub>2</sub>], [M(AA)<sub>2</sub>B<sub>2</sub>], [MA<sub>3</sub>B<sub>3</sub>] using suitable 3. Isomerism in coordination compounds, stereo isomerism - (a) Geometrical isomerism in (i) (ii) Octahedral complexes [M(AA)2B2], [M(AA)3] using suitable examples. Structural isomerism: ionization, (b) Optical isomerism in (i) Tetrahedral complexes [MABCD], linkage, coordination ligand isomerism using suitable examples.

# S3-I-3: Metal carbonyls and Organometallic Chemistry

4 <del>1</del>

Methods of properties of Ni(CO)4. Structural features of Ni(CO)4, Fe(CO)5, Fe2(CO)9, Fe3(CO)12 and Cr(CO)6-18 valence electron rule. Metal carbonyls: Preparation and

Ŕ compounds. preparation, properties and applications of alkyl and aryl compounds of Li, Mg & nomenclature and classification of organometallic Definition,

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### Unit – II (Organic Chemistry)

### S3-O-1: Carboxylic acids and derivatives

Introduction, Nomenclature, Preparation: a) Hydrolysis of Nitriles, amides and esters. b) Carbonation of Grignard reagents. Special methods of preparation of Aromatic Acids - Oxidation of Arenes. Physical properties- hydrogen bonding, dimeric association. Chemical properties – Reactions involving H, OH and COOH groups - salt formation, anhydride formation, Acid halide formation, Esterification (mechanism) & Amide formation. Reduction of acid to the corresponding primary alcohol *via* ester or acid chloride. Degradation of carboxylic acids by Huns Diecker reaction, Schmidt reaction (Decarboxylation). Arndt – Eistert synthesis, Halogenation by Hell – Volhard - Zelensky reaction. Carboxylic acid Derivatives – Hydrolysis and Ammonolysis of acid halides, Acid anhydrides and esters (mechanism of ester hydrolysis by base and acid). Hydrolysis and dehydration of amides.

### S3-O-2: Nitrohydrocarbons

Introduction, Nomenclature and classification of Nitro hydrocarbons, Structure, Tautomerism of Nitroalkanes leading to aci and keto forms, Preparation of Nitroalkanes. Reactivity - halogenation, reaction with HNO<sub>2</sub> (Nitrous acid), Nef reaction, reduction. Aromatic Nitrohydrocarbons: Preparation of Nitrobenzene by Nitration.

Physical properties, chemical reactivity - Reduction of Nitrobenzenes in different media.

### S3-O-3: Amines, Cyanides and Isocyanides

Introduction, Nomenclature, Amines: classification into 1°, 2°, 3° Amines and Quarternary ammonium compounds. Preparative methods – Ammonolysis of alkyl halides, Gabriel synthesis, Hoffman's bromamide reaction (mechanism). Reduction of Amides and Schmidt reaction. Physical properties. Use of amine salts as phase transfer catalysts. Chemical Properties: a) Alkylation b) Acylation c) Carbylamine reaction d) Hinsberg separation. Reaction with Nitrous acid of 1°, 2°, 3° (Aliphatic and aromatic amines). Electrophilic substitutions of Aromatic amines – Bromination and Nitration, oxidation of aryl and 3° Amines, diazotisation. Diazonium salts: Preparation with mechanism. Synthetic importance – a) Replacement of diazonium group by – OH, X (Cl) - Sandmeyer and Gatterman reaction, by fluorine (Schiemann's reaction), by iodine, CN, NO<sub>2</sub>. H and aryl groups. Coupling Reaction of diazonium salts. i) with phenols ii) with anilines. Reduction to phenyl hydrazines.

**Cyanides and isocyanides:** Structure. Preparation of cyanides from a) Alkyl halides b) from amides c) from aldoximes. Preparation of isocyanides from Alkyl halides and Amines. Properties of cyanides and isocyanides, a) hydrolysis b) addition of Grignard reagent iii) reduction iv) oxidation.

13

5h

7 h

### Unit III (Physical Chemistry)

### S3-P-1: Thermodynamics-I

Introduction to Thermodynamics- First law of thermodynamics statement- various forms mathematical expression. Zeroth law of thermodynamics - State function and path functions. Energy as a state function and exact differential. Work of expansion and heat absorbed as path function.

Expression for work of expansion, sign convention problems on first law. Heat changes at constant pressure and heat changes at constant volume. Enthalpy. Heat capacities at constant pressure and constant volume. Derivation of  $C_p - C_v = R$ . Isothermal adiabatic processes. Reversible and irreversible processes. Reversible change and maximum work. Derivation of expression for maximum work for isothermal reversible process. Problems. Internal energy of an ideal gas. Joules experiment. Joule-Thompson coefficient. Adiabatic changes in ideal gas, derivation of equation,  $PV^{\gamma}$  = constant. P-V curves for isothermal and adiabatic processes. Heat of a reaction at constant volume and at constant pressure, relation between  $\Delta H$  and  $\Delta V$ . Variation of heat of reaction with temperature. Kirchhoff's equation and problems. Limitations of first law and need for second law. Statement of second law of thermodynamics. Cyclic process. Carnot's theorem, Carnot's cycle. Derivation of efficiency of heat engine. Problems.

### S3-P-2: Thermodynamics-II

Entropy: Definition from Carnot's cycle. Entropy as a state function. Entropy as a measure of disorder. Sign of entropy change for spontaneous and non- spontaneous processes & equilibrium processes. Entropy changes in i). Reversible isothermal process, ii). Reversible adiabatic process, iii). Phase change, iv). Reversible change of state of an ideal gas. Problems. Entropy of mixing of ideal gases. Third law of thermodynamics - significance - Free energy Gibb's function (G) and Helmholtz's function (A) as thermodynamic quantities. Concept of maximum work and network  $\Delta G$  as Criteria for spontaneity. Derivation of equation  $\Delta G = \Delta H - T\Delta S$ . Significance of the equation. Gibbs equations and Maxwell relations. Variation of G with P, V and T.

### Unit – IV (General Chemistry)

### S3-G-1: Evaluation of Analytical Data

Significant figures, accuracy and precision. Errors-classification of errors - determinate and indeterminate errors, absolute and relative errors. Problems based on mean, median, range, standard deviation

### S3-G-2: Carbanions-I

Introduction, acidic nature of  $\alpha$ -hydrogens and tautomerism in carbonyl compounds, nitro hydrocarbons, ethyl acetoacetate, diethyl malonate. Terminal alkynes. Stabilty of carbanions Reactions: Aldol reaction, Perkin reaction, Benzoin condensation, haloform reaction, conversion of lower alkynes to higher alkynes.

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### 15 h (1hr/week) 4 h

5 h

### डॉ.एम.एस. राधिका, पीएवडी (पोषण) Dr. M.S. RADHIKA, PhD (Nutrition) वैज्ञानिक-ई (उप निदेशक) व विभागाध्यक्ष

Science-E & Head of the Department आहारविज्ञानविभाग, आईसीएमआर-राष्ट्रीयपोषणसंस्थान Department of Dietetics, ICMR-National Institute of Nutrition जाผ่าวระเดิน [ปโช], โร่สระสเตะ 4000 00%, พาสส Jamai-Osmania (PO), Secunderabad-500 007, INDIA

### 15 h (1hr/week)

10 h

### S3-G-3: Phase Rule

Statement and meaning of the terms - Phase, Component and Degrees of freedom, Gibb's Phase rule, phase equilibria of one component system - water system. Phase equilibria of twocomponent system - Solid-Liquid equilibria, simple eutectic - Pb-Ag system, desilverisation of lead. Solid solutions - compound with congruent melting point - Mg-Zn system and incongruent melting point - NaCl-H<sub>2</sub>O system.

### References

General reference: B.Sc II Year Chemistry : Semester III, Telugu Academy publication, Hyd.

### Unit-I

- 1. Analytical chemistry by G. L. David Krupadanam, D. Vijaya Prasad, K.Varaprasada Rao, K.L.N. Reddy and C.Sudhakar
- 2. Principles of Inorganic Chemistry by Puri, Sharma and Kalia Vishal Publications (1996).
- 3. Concise Inorganic Chemistry by J.D. Lee 3<sup>rd</sup> Edition Van Nostrand Reinhold Company (1977)
- 4. Basic Inorganic Chemistry by F.A.Cotton, G.Wilkinson and Paul.L. Gaus 3rd edn Wiley Publishers (2001).
- 5. Inorganic Chemistry Principles of structure and reactivity by James E. Huhey, E.A. Keiter and R.L. Keiter 4<sup>th</sup> Edition (2006).
- 6. Chemistry of the elements by N.N.Greenwood and A. Earnshaw Pergamon Press (1989).
- 7. Inorganic Chemistry by Shriver and Atkins 3rd edn Oxford Press (1999).
- 8. Textbook of Inorganic Chemistry by R Gopalan(UniversitiesPress (2012)
- 9. College Practical Chemistry by V K Ahluwalia, Sunitha Dhingra and Adarsh Gulati Universities Press (India) Limited (2012)

### Unit-II

- 1. Text book of organic chemistry by Soni. Sultan Chand & Sons; Twenty Ninth edition (2012).
- 2. General Organic chemistry by Sachin Kumar Ghosh. New Age Publishers Pvt Ltd (2008).
- 3. Text book of organic chemistry by Morrison and Boyd. Pearson Publications (2009).
- 4. Text book of organic chemistry by Graham Solomons. Wiley Publications (2015).
- 5. Text book of organic chemistry by Bruice Yuranis Powla. (2012).
- 6. Text book of organic chemistry by C N Pillai, CRC Press (2012).
- 7. Organic Chemistry by L. G. Wade Jr.
- & Organic Chemistry by M. Jones Jr.
- 9. Organic Chemistry by John McMurry.

### Unit III

- 1. Principles of physical chemistry by Prutton and Marron. The Macmillan Company; 4<sup>th</sup>Edn. (1970)
- 2. Text Book of Physical Chemistry by Soni and Dharmahara. Sulthan Chand and Sons.(2011)
- 3. Text Book of Physical Chemistry by Puri and Sharma. S. Nagin chandand Co.(2017)
- 4. Text Book of Physical Chemistry by K. L. Kapoor.(2012)
- 5. Physical Chemistry by Ira Levine (Author) McGraw-Hill Education; 6th Edition (May 9, 2008

15

डॉ.एम.एस. राधिका, वीएवडी (पोषण) Dr. M.S. RADHIKA, PhD (Nutrition) ई (उप निदेशक) व विभागाध्य Science-E & Head of the Departm आहारविज्ञानविभाग, आईसीएमआर-राष्ट्रीयपोषणसंस्थ Department of Dietetics, ICMR-National Institute of Nut जामे-उस्मानिया (पोस्ट), सिकदराबाद-५००० ००७, भारत Jamai-Osmania (PO), Secunderabad 500.007. IND/A

### Unit IV

- 1. Fundamentals of Analytical Chemistry by Skoog and West, Saunders College Publications, 1982.
- 2. Text book of organic chemistry by Morrison and Boyd, Pearson Publications (2009).
- 3. Text book of organic chemistry by Graham Solomons, Wiley Publications (2015)
- 4. Text book of organic chemistry by Sony, Sultan Chand & Sons; 29th Edition (2012)
- 5. Text book of organic chemistry by Bruice Yuranis Powla, (2012)
- 6. General Organic chemistry by Sachin Kumar Ghosh, New Age Publishers Pvt Ltd (2008).
- 7. Text Book of Physical Chemistry by Soni and Dharmahara. Sulthan Chand and Sons.(2011)
- 8. Text Book of Physical Chemistry by Puri and Sharma. S. Nagin chandand Co.(2017)

### Laboratory Course

### Paper III (Organic Synthesis)

45 h (3h/week)

- 1. Synthesis of Organic Compounds:
  - Acylation: Preparation of Aspirin and Benzanilide.
  - Aromatic electrophilic substitution: Nitration: Preparation of *m*-dinitro benzene.
  - Three component coupling: One pot synthesis of dihydropyrimidinone

Halogenation: Preparation of p-bromo acetanilide, 2,4,6-tribromo phenol

Oxidation: Preparation of Benzoic acid

Esterification: Preparation of n-Butyl acetate.

Methylation: Preparation of  $\beta$  - Naphthyl methyl ether (Naroline).

Condensation: Preparation of Benzilidine aniline.

Diazotisation: Azo-coupling of β-Naphthol.

2. Microwave assisted synthesis of Asprin – DEMO (demonstration only)

### **References:**

- .1. Lab manual for UG students prepared by Department of Chemistry, University College for Women, Koti, Hyd.
- 2. Practical Organic Chemistry by Mann and Saunders, 1974, Longmann Publications.
- 3. Comprehensive Practical Organic Chemistry Preparation and Quantitative Analysis by V. K. Ahluwalia and Renu Aggarwal, Orient Black Swan Publishers, 2004.

16

ਤੱ, एम. एस. राधिका, पीएवडी (पोषण) Dr. M.S. RADHIKA, Pho (Nutrition) बैज़ानिक ई (उप लिरेशक) व निभारणस्था Science: & Head of the Dispariment आहारविज्ञानविभाग, आई सीएमआर र राष्ट्रीयपोषण संस्थान Department of Dietetics. ICMR-National Institute of Nutrition जामे, इस्लीबिंग (1942, रीजरेटर के प्रदान 2018) स्थान जाम - Osmania (190) Security के साथ ज्यात 2018 (1974)

### B.Sc. Chemistry II Year Semester-III Skill Enhancement Course- I (SEC-I) (2 Credits) Rules in Chemistry Laboratory and Lab Reagents

### Unit I: Laboratory Safety Rules and Regulations

General rules and regulations for lab safety: Minimizing Risks of Hazards, Personal Protective Equipment (PPE) - Hair, Dressing for the Laboratory, Eye Protection, Eyewash fountain, Gloves, Laboratory Protocols, Labeling Chemicals, Careful reading of labels Prevention of Inhaling Harmful Chemicals, Guide to Chemical Hazards, Chemical Spills etc. Accidents use of fire extinguisher and first aid kit in the laboratory, safety symbols- Preparation of the charts by the students and display of chats in chemistry labs. Calibration of fractional weights, calibration of glass ware - burette, pipette, standard flask, Normality/Molarity and specific gravity of concentrated acids - Preparation of dilute solutions (Numerical problems). Precautions to be taken in the preparation of dilute acids and bases. Preparation of stock solutions of salts with specific examples. Properties of primary standard salt and preparation of standard solution. Good laboratory practices-maintenance of observation book and record.

### **UNIT 2: Preparation of Lab Reagents**

Preparation of indicators and use of indicators in volumetric analysis- acid base titrations, redox titrations, precipitation titrations and complexometric titrations. Role of an indicator in detecting end point (Phenolphthalein, Methyl orange, Methyl-red, Potassium Chromate, Diphenylamine, EBT, Murexide, etc). Preparation of buffers - pH 10 ammonical buffer and acetate buffer solutions. Preparation of commonly used reagents : Ammonium hydroxide solution, Ammonium molybdate reagent, Ammonium hydrogen phosphate solution, Bayer's reagent, Benedict's solution, Bromine water, Dimethyl glyoxime reagent, 2,4-Dinitrophenyl hydrazine reagent, Eriochrome black-T reagent Fehling solution, Ferric chloride solution, Ferrous sulphate solution, Iodine solution, Molisch's reagent, Nessler's reagent, Neutral FeCl<sub>3</sub>, Schiff's reagent, Silver nitrate solution, Sodium carbonate solution, Sodium hydroxide (Caustic soda) solution, Starch solution, Tollen's reagent. (reference work and submission of assignments). Charts preparation depicting course content.

### RECOMMENDED BOOKS

- 1. Vogel's Text Book of Quantitative Chemical Analysis, 5thedition.
- 2. Vogel's Text Book of macro and semimicro qualitative inorganic analysis. G. Svehla,5th edition.
- 3. Chemistry Reagent Manual Prepared by Chemistry Department, SGTB Khalsa Collegeunder DBT's Star College Scheme, University of Delhi (Available: online)
- 4. American Chemical Society Safety in Academic Chemistry Laboratories 8thedition.

[Course objectives (CO)]: To improve the skills of students in the application of theory and practical knowledge. To fill the gap between theory and practicals. To train the students in understanding laboratory safety rules and to improve the skills in preparation of laboratory reagents]

### 15 h (1 hr/week)

### 15 h (1 hr/week)

### B.Sc. Chemistry II Year Semester III Skill Enhancement Course- II (SEC –II) (2 Credits) REMEDIAL METHODS FOR POLLUTION, DRINKING WATER AND SOIL FERTILITY STANDARDS

### UNIT I: Remedial Methods for Pollution Prevention and control of air pollution 15 h (1hr/week)

Ozone hole-causes and harm due to ozone depletion. The effect of CFCs in Ozone depletion and their replacements. Global Warming and Greenhouse Effect Precautions to control global warming. Deleterious effect of pollutants - Endangered Monuments- acid rain. Precautions to protect monuments. Sources of Radiation pollution - Chernobyl accident and its Consequences. Radiation effect by the usage of cell phones and protection tips. Deleterious effects of cell phone towers and health hazards.

Sources of water pollution-(i) Pollution due to pesticides and inorganic chemicals, (ii) Thermal pollution (iii) Ground water pollution (iv) Eutrophication.

Methods for control of water pollution and water recycling. Dumping of plastics in rivers & oceans and their effect on aquatic life. Determination of (i) Dissolved Oxygen and (ii) Chemical Oxygen Demand in polluted water - Illustration through charts (or) demonstration of experiments. Sources of soil pollution (i) Plastic bags, (ii) Industrial and (iii) Agricultural sources. Control of soil pollution. Environmental laws in India. Environmental benefits of planting trees.

### UNIT II: Drinking Water and Soil Fertility Standards and Analysis 15 h (1 hr/week)

Water Quality and Common Treatments for Private Drinking Water Systems: Drinking Water Standards-Primary Drinking Water Standards: Inorganics, Organics and Volatile Organic Chemicals. Secondary Drinking Water Standards-Inorganics and Physical Problems. Water Testing, Mineral Analysis, Microbiological Tests, Pesticide and Other Organic Chemical Tests. Principle involved in Water Treatment Techniques. (i) Reverse osmosis (ii) Disinfection methods such as chlorination, ultraviolet light, ozonation etc (iii) Chemical oxidation and (iv) Ion exchange (water softeners). Visit to nearby drinking water plants and interaction at sites.

Introduction to Soil Chemistry- Basic Concepts. Effect of pH on nutrient availability. Macronutrients and their effect on plants -Carbon, Hydrogen, Oxygen, Nitrogen and Phosphorus other macronutrients-Calcium, Magnesium and Sulfur. Micronutrients and their effect on plants. Boron ( $B_4O_7^{2-}$ ), Copper ( $Cu^{2+}$ ), Iron (Fe<sup>2+</sup>, Fe<sup>3+</sup>) Manganese ( $Mn^{2+}$ ), Molybdenum ( $MoO_4^{2-}$ ), Zinc ( $Zn^{2+}$ ), Cobalt ( $Co^{2+}$ ), Chlorine (Cl<sup>-</sup>) and Others. Determination of soil nitrogen by Kjeldahl method- Illustration through charts (or) demonstration of experiment. Visit to nearby agricultural farms and interaction with farmers. Discussion with farmers on the use of Soil Analysis Kits.

### References

1. Remedial methods for pollution, drinking water and soil fertility standards, Author: Dr G. 2. Remedial methods for pollution, drinking water and soil fertility standards, Telugu version, Authors: Dr N. Yogi Babu, Dr. G. Vanajatha, M.Srilatha. 3. Environmental Pollution, download.nos.org/333courseE/10.pdf

4. CFC Replacements, butane.chem.uiuc.edu/pshapley/Environmental/L21/3.html 5. Effects of Acid Rain on Buildingswww.air-quality.org.uk/12.php

6. Acid Rain

Effects **Buildings** chemistry.elmhurst.edu/vchembook/196buildings.html Chemistry 7. Determination of dissolved oxygen (DO)

www.cutm.ac.in/pdf/env%20engg%20lab%20manual.pdf 18. Determination of chemical oxygen demand of wastewater www.pharmaguideline.com > quality control >test 8. How to protect national heritage -ways to protect monuments

www.youthkiawaaz.com/2011/03/how-to-protect-national-heritage/.

9. Chernobyl nuclear power plant accident - NRC www.nrc.gov/reading-rm/doccollections/fact-sheets/chernobyl-bg.pdf

10. Side-effects of harmful radiation from mobile phones andtowers pib.nic.in/newsite/printrelease.aspx?relid=116304

11. Cell Phone Radiation Protection - Highly Effective Tips https:

www.electricsense.com/775/how-to-protect-yourself-from-cell-phone-radiation/ 12. Chemical Waste That Impact on Aquatic Life or Water Quality blog.idrenvironmental.com/chemical-waste-that-impact-on-aquatic-life-or-waterquality 13. Trees and Your Environment Clean Air Gardening www.cleanairgardening.com/plantingtrees

14. 14.water and quality common treatments for private drinking water .extension.uga.edu/publications/detail.html?number=b939

15. Soil chemistryhttps://casfs.ucsc.edu/about/publications/Teaching-Organic-

Farming/PDFdownloads/2.2-soil-chemistry.pdf

16. Soil Analysis-Determination of Available Nitrogen. - Amrita Virtual Lab vlab.amrita.edu/?sub=2&brch=294&sim=1551&cnt=1

Jamai-Osmania (PO), Secunderabad-500 007, INDIA

डॉ.एम.एस. राधिका, पीएवडी (पोषण) Dr. M.S. RADHIKA, PhD (Nutritic वैज्ञानिक-ई (उप निदेशक) व वि ence-E & Head of the Department आहारविज्ञानविभाग, आई सीएमआर-राष्ट्रीयपोषणसंस्थान Department of Dietetics, ICMR-National Institute of Nutrition जामे-उस्मानिया (पोस्ट), सिकदराबाद-४००० ००७, भारत

### Semester V **BS 501**

Generic Elective (GE) Course – I (4 Credits)

(for B.Sc. Non-Chemistry / B.A./B. Com. Students)

Chemistry of Cosmetics, Food Processing, Drugs and Pharmaceuticals **60 Hrs** 

### **Unit-I: Chemistry of Cosmetics and Perfumes**

A general study including preparation and uses of the following: Hair dye, hair spray, shampoo, sunscreen lotions, lipsticks, talcum powder, nail enamel, creams (cold, vanishing and shaving creams), antiperspirants and artificial flavours. Essential oils and their importance in cosmetic industries with reference to eugenol, geraniol, sandalwood oil, eucalyptus, 2-phenyl ethyl alcohol.

Demonstration experiments or illustration of experimental procedures through charts for the preparation of talcum powder, shampoo and vanishing cream. Analysis of deodorants and antiperspirant - Aluminium, Zinc, Boric acid, Chloride and Sulphide.

### Unit-II: Food Processing and Food Adulteration

Food processing: Introduction, principles of food processing, methods of food processing, impact of food processing on nutritive value, additives and preservatives.

Food Packaging: Definition, need, importance, functions, different packaging materials, impact of packaging materials on the nutritive value of foods.

Food labelling: Introduction, need and importance, understanding food labelling.

Food adulteration: Definition, need and importance, common adulterants in foods: cereals, legumes and their products, milk and milk products, fats and oils, spice and condiments, sugars and sugar products and miscellaneous products.

### Unit-III: General Characteristics of Drugs

Introduction: Diseases - causes of diseases in general, Characteristics of an ideal drug. Drug - definition and sources. ADME of drugs (brief) - Absorption, distribution, drug metabolism (in liver), elimination (brief),

Nomenclature of Drugs: chemical name - generic name - trade name. Trade names for the given generic names - (i) Aspirin (ii) Amoxycillin (iii) Ciprofloxacin (iv) Paracetamol (v) Mebendazole

Drug formulations: Definition - need for conversion of drug into pharmaceutical (drug formulations) - Additives - diluents, binders, lubricants, antioxidants, flavourants, sweeteners, colourants, coating agents. Classification of Drug formulations: oral, parenterals and topical dosage forms - advantages and disadvantages.

(i) Oral dosage forms: Tablets (Ciprofloxacin – antibacterial). Capsules (Amoxycillin – antibiotic). Syrups (Benadryl - Cough syrup).

(ii) Parenterals: (Injection forms): Propanolol (antihypertensive)

(iii) Topical dosage forms: Creams and Ointments

(iv) Antiallergic: Betamethasone valerate (2%), Multiple purposes

(v) Anti-itching: Doxepin, Antifungal: Miconozole (Dactarin, Neomicol), Anaesthetic -

Lidocaine (Lidocaine ointment) and Antiseptic: Boro Plus cream, For burns - Iodine ointment.

15 Hrs

### 15 Hrs

### 15 Hrs

### 15 Hrs

### Unit - IV: Classification of Drugs

Classification of drugs based on therapeutic action – Chemotherapeutic agents, pharmacodynamic agents and drugs acting on metabolic processes. Structure and therapeutic activity for the following:

(i) Chemotherapeutic agents: Antimalarials – chloroquine; Antibiotic – Amoxicillin; Antitubercular drugs - isoniazide; Antiprotozoals - metronidazole.

### (ii) Pharmacodynamic agents:

- (a) Drugs acting on CNS: Diazepam (CNS Depressant), General anaesthetic (thiopental sodium), antipyretic and analgesic (Ibuprofen).
- (b) Drugs acting on PNS: local anaesthetics (Benzocaine)
- (c) Drugs acting on cardiovascular system: Metoprolol (antihypertensive agents), Nefidipine (antianginal and antihypertensive agent)
- (d) Drugs acting on renal system: Diuretics (Acetazolamide)

### (iii) Drugs acting on metabolic processes:

- (a) Vitamins: Common name, source, deficiency, vitamin A, B2, B6, C, D, E and K remedy
- (b) Hormones: Function (brief) deficiency of hormones (Insulin, Testosterone and Estrogen).

### **Recommended Text Books and Reference Books**

- E. Stocchi: Industrial Chemistry, Vol -I, Ellis Horwood Ltd. UK. 1.
- P.C. Jain, M. Jain: Engineering Chemistry, Dhanpat Rai & Sons, Delhi. 2.
- Sharma, B.K. & Gaur, H. Industrial Chemistry, Goel Publishing House, Meerut (1996). 3.
- Rameen Devi, Food Processing and Impact on Nutrition, Sc J Agric Vet Sci., Aug-Sep 4.
- 2015; 2(4A):304-311.
- W.A. Poucher, Perfumes, Cosmetics and Soaps (1993). 5.
- Srilakshmi, Food Science. Edition: 3 rd (2004). 6.
- Lillian Hoagland Meyer, Food chemistry (2008). 7.
- Handbook of Analysis and Quality Control for Fruit and Vegetable Products, S. Ranganna, 8. Tata McGraw-Hill Education, 1986 - Food.
- Fundamental concepts of applied chemistry J.C Ghosh, S. Chand and Co, Ltd, New Delhi. 9.
- 10. Applied Chemistry K .Bhagavathi Sundhar, MJP publishers.
- 11. Drugs by G.L.David Krupadanam, D.Vijaya Prasad, K.Varaprasad Rao, K.L.N.Reddy, C.Sudhakar, Universities Press (India) Limited 2007.
- 12. An Introduction to Medicinal Chemistry by Graham L. Patrick, Oxford University Press, New York. 1995.
- 13. Chemistry text book for B.Sc., Vol. IV published by Telugu Academy, Govt. of Telangana.
- 14. A Handbook of food packaging by F. A. Paine and H.Y. Paine.
- 15. Principles of food packaging by Stanley Sacherow and C Griffin.
- 16. Food packaging and preservation by M Mathlouthi.
- 17. Principles of food packaging by R. Heiss.
- 18. Food packaging (Principles & Practice) by Gordan and L Raboertson.

### **B.Sc. Chemistry III Year** Semester-V, Paper-V, BS 506 **Discipline Centric Elective - A (4 Credits)** Spectroscopy and Chromatography

### Unit I: Molecular Spectroscopy

15Hrs

60Hrs

S5-E-A-I: Introduction to electromagnetic radiation, interaction of electromagnetic radiations with molecules, various types of molecular spectra.

### Rotational spectroscopy (Microwave spectroscopy)

Rotational axis, moment of inertia, classification of molecules (based on moment of inertia), rotational energies, selection rules, determination of bond length of rigid diatomic molecules. Eg. HCI.

### Infra red spectroscopy

Energy levels of simple harmonic oscillator, molecular vibration spectrum, selection rules. Determination of force constant. Qualitative relation of force constant to bond energies. Anharmonic motion of real molecules, energy levels and selection rules. Modes of vibrations in polyatomic molecules - Linear molecules: HX, CO<sub>2</sub>, Acetylene and Non-Linear molecules: NH<sub>3</sub>, H<sub>2</sub>O and BX<sub>3</sub>. Characteristic absorption bands of various functional groups. Finger print nature of infrared spectrum.

### Electronic spectroscopy

General features of absorption - spectroscopy, transmittance, absorbance, and molar absorptivity. Bonding and antibonding molecular orbitals, electronic energy levels of molecules  $(\sigma, \pi, n)$ , types of electronic transitions:  $\sigma$ - $\sigma$ \*, n- $\sigma$ \*, n- $\pi$ \*,  $\pi$ - $\pi$ \* with suitable examples. Selection rules, Terminology of chromophore, auxochrome, bathochromic and hypsochromic shifts. Effect of conjugation on  $\lambda_{max}$ : diene, enone and aromatic chromophores. Representation of UV-visible spectra. Beer Lambert's law and its limitations, difference between Colorimetry and Spectrophotometry. Verification of Beer's law. Estimation of (i) Chromium and (ii) Manganese.

### Unit II: NMR and Mass Spectrometry

### 15Hrs

### S5-E-A-II: Proton Magnetic Resonance Spectroscopy

Magnetic properties of nuclei, Principles of nuclear magnetic resonance, equivalent and nonequivalent protons, position of signals. Chemical shift, factors affecting chemical shifts, NMR splitting of signals - spin-spin coupling, shielding and de-shielding effect, coupling constant, representation of proton NMR spectrum - Integrations. 'H NMR spectrum of - ethyl bromide, acetaldehyde, 1,1,2-tribromo ethane, ethyl acetate, acetophenone, benzoic acid and benzaldehyde. Application - Reaction mechanism (cyclic bromonium ion), E-Z isomers, Hydrogen bonding and Keto-enol tautomerism.

### Mass Spectrometry

Electron Impact Mass: Basic principles, Nitrogen rule, types of ions: Molecular ion and fragment ions. Representation of mass spectrum, types of peaks (molecular ion peak, base peak and isotopic ion peaks). Ortho effect, Retro Diel's-Alder reaction and McLafferty Rearrangement -Definition with one example each. Determination of molecular formula. Mass spectrum of ethyl chloride, ethyl bromide, acetophenone, benzoic acid and benzamide.

### Unit III: Separation techniques - I

**S5-E-A-III: Solvent Extraction-** Principle, Methods of extraction: Batch extraction, continuous extraction and counter current extraction. Separation of metals as metal chelates - Determination of Iron (III). **Chromatography:** Classification of chromatographic methods, principles of differential migration, adsorption phenomenon, nature of adsorbents, solvent systems.

**Thin layer Chromatography (TLC)**: Principle, Advantages, preparation of plates, Solid phase and mobile phase used in TLC, elutropic series, development of the chromatogram, Detection of the spots, visualizing agents, factors effecting Rf values and applications of TLC – purity of the sample and monitoring the progress of the reaction.

**Paper Chromatography**: Principle, choice of paper and solvent systems, development of chromatogram – ascending, descending, radial and two-dimensional chromatography, detection of spots, and applications of paper chromatography.

### Unit IV: Separation techniques - II

15Hrs

**S5-E-A-IV:** Column Chromatography- Principle, Types of stationary phases, Column packing – Wet packing technique, Dry packing technique. Selection criteria of mobile phase solvents for eluting polar, non-polar compounds and its applications.

**Ion exchange chromatography**: Principle, de-ionized water. Cation and anion exchange resins, its application in separation of ions,

**Gas Chromatography**: Principle, theory and instrumentation (Block Diagram), Types of stationary phases and carrier gases (mobile phase), applications of GC.

**High performance liquid chromatography**: Principle, theory and instrumentation, stationary phases and mobile phases. Applications of HPLC, Analysis of paracetamol.

### **Recommended Text Books and Reference Books**

- 1. Fundamentals of Molecular Spectroscopy by C. N. Banwell and E. M. McCash, fourth Edition, McGraw Hill Education, 1994.
- Organic spectroscopy, William Kemp, Palgrave Macmillan; 2nd Revised edition (1<sup>st</sup> February 1987)
- 3. Analytical Chemistry by David Krupadanam, Universities Press (India) Limited.
- 4. D.A. Skoog, F.J. Holler, T.A. Nieman, Principles of Instrumental Analysis, Engage earning India Ed.
- 5. D. A. Skoog, D.M. West, F.J. Holler, Fundamentals of Analytical Chemistry, Sixth Edition, Saunders College Publishing, Fort worth (1992).
- 6. Willard, H.H., Merritt, L.L., Dean, J. & Settoe, F.A. Instrumental Methods of Analysis. 7<sup>th</sup> Ed. Wadsworth Publishing Co. Ltd., Belmont, California, USA, 1988.
- 7. Harris, D. C. Quantitative Chemical Analysis, W. H. Freeman. 2007.
- 8. Dean, J. A. Analytical Chemistry Notebook, McGraw Hill.
- 9. Day, R. A. & Underwood, A. L. Quantitative Analysis, Prentice Hall of India.
- 10. Cooper, T.G. The Tools of Biochemistry, John Wiley and Sons, N.Y. USA. 16, 1977.
- 11. Vogel, A. I. Vogel's Qualitative Inorganic Analysis 7th Ed., Prentice Hall.
- 12. 12. Robinson, J.W. Undergraduate Instrumental Analysis 5th Ed., Marcel Dekker, Inc, New York (1995).
- 13. Analytical Chemistry 7 th edition by Gary D. Christian (2004).
- 14. M.N Sastry, Separation Methods, Paperback (2004), Himalaya Publication.

### **B.Sc. Chemistry III Year** Semester-V, Paper-V, BS 506 Discipline Centric Elective-B (4 Credits) Metallurgy, Dyes and Catalysis

Unit I: General Principles of Metallurgy and Production of Non Ferrous Metals 15 Hrs S5-E-B-I: Pyrometallurgy: Drying and calcination, roasting, smelting, products of smelting, Hydrometallurgy: Leaching methods, leaching agents, leaching of metals, oxides and sulphides.

Separation of liquid and solid phases and processing of aqueous solutions Electrometallurgy: Electrolysis, Refining electrolysis, electrolysis from aqueous solutions, fused-salt electrolysis

Refining processes: Chemical and physical refining processes

Production of selected non-ferrous metals (Copper, Nickel, Zinc): Properties, raw materials, production (flow charts presentations and chemical reactions involved) and uses.

### Unit II: Natural and Synthetic Dyes

S5-E-B-II: Dyes: Definition, Classification of dyes- Natural dyes, synthetic dyes; based on chemical constitution of dyes; Chemical nature of dyes; Applications of dyes.

Stuctures of natural dyes: Indigo, Tyrian purple, Alizarin, Indigotin.

Structures of Synthetic Dyes: Nitrodyes, Nitrosodyes, Azodyes (Mono azodyes, bisazodyes), diaryl methane dyes, triaryl methane dyes, Xanthene dyes, Phenolphthalein, Fluorocein, Acridine dyes.

Synthesis of dyes: Mono azodyes, bisazodyes (Congo red), Auromine O, Malachite Green, Crystal Violet, Rhodamine B, Acridine Yellow, Indigotin .

Binding of dyes to fabric. Applications of dyes.

### Unit III: Catalysis I

### S5-E-B-III: Homogeneous and heterogeneous catalysis -

Definition of a catalyst and catalysis. Comparison of homogeneous and heterogeneous catalysis with specific examples. General characteristics of catalytic reactions.

Acid-base catalysis- Examples of acid and base catalysed reactions, hydrolysis of esters. Kinetics of acid catalysed reactions. Specific acid and general acid catalysis, Kinetics of base catalysed reactions. Specific base and general base catalysis. Examples-Aldol condensation and decomposition of nitramide, base catalysed conversion of acetone to di acetone alcohol. Mutarotation of glucose, Effect of pH on reaction rate of acid and base catalysed reactions.

Phase transfer catalysis: Principle of phase transfer catalysis, classification of phase transfer catalysts. Factors influencing the rate of PTC reactions.

### Unit IV: Catalysis II

### 15Hrs

S5-E-B-IV: Enzyme catalysis- Characteristics of enzyme catalysis, Examples: (i) Invertase in inversion of cane sugar (ii) Maltase in conversion of maltose to glucose (iii) Urease in decomposition of urea (iv) Zymase in conversion of glucose to ethanol (v) working of carbonic

anhydrase and (vi) Mechanism of oxidation of ethanol by alcohol dehydrogenase Factors

15Hrs

60 Hrs

15Hrs

affecting enzyme catalysis. Effect of temperature, pH, concentration and effect of inhibitor on enzyme catalysed reactions, Catalytic efficiency.

Kinetics of enzyme catalysed reactions: Michaelis-Menton Equation. Mechanism of enzyme catalysed reactions. Significance of Michaelis constant (Km) and maximum velocity (Vmax), Lineweaver-Burk plot. Types of enzyme inhibitors

### **Recommended Text Books and Reference Books**

- 1. Industrial Chemistry E. Stocchi, Vol-I, Ellis Horwood Ltd. UK.
- 2. Elementary Principles of Chemical Processes, R.M. Felder, R.W. Rousseau: Wiley Publishers, New Delhi.
- 3. Handbook of Industrial Chemistry, J. A. Kent: Riegel's, CBS Publishers, New Delhi.
- 4. Theory of production of non- ferrous metals and alloys Study. Kateřina Skotnicová, Monika Losertová, Miroslav Kursa
- 5. The Chemistry of Synthetic Dyes, Volume 4, K Venkataraman Elsevier, Technology & Engineering.
- 6. Organic Chemistry Vol-I by I.L. Finar.
- 7. Organic Chemistry by Jennice, Gorzinski Smith
- 8. Natural Dyes: Sources, Chemistry, Application and Sustainability Issues by Sujata Saxena and A. S. M. Raja.
- 9. Physical Chemistry by Atkins and De Paula, 8 th Edn.
- 10. Physical Chemistry by Puri, Sharma and Pattania, 2017.
- 11. Kinetics and mechanism of chemical transformations by Rajarajm and Kuraiacose,
- Published by Macmillan India Ltd. 12. Text book of Physical Chemistry by K.L. Kapoor Macmillan, 1999.
- 13. Catalysis by J.C. Kuriacose, Macmillan Macmillan Publishers India Limited, 1980.

डॉ.एम.एस. राधिका, पीएवडी (पोषण) RADHIKA, PhD (NU MS ore-E&I आहारविज्ञानविभाग, आईसीएमआर-राष्ट्रीयपोषणसस्थान rtment of Dietetics, ICMR-National Institute of Nutrition mix-generative (inter, Reactaic-yoo) cos, sitze Jama-Osmania (PO). Secunderabar 500.007. NO-A

### Semester - V Laboratory Course - V Experiments in Physical Chemistry-I

### **Physical Chemistry**

### 45 h (3 h / w)

### 1. Distribution law

- a) Determination of molecular status and partition coefficient of benzoic acid in Toluene and water.
- b) Determination of distribution coefficient of acetic acid between n-butanol and water.

### 2. Electrochemistry

- a) Determination of concentration of HCl conductometrically using standard NaOH solution.
- b) Determination of concentration of CH<sub>3</sub>COOH conductometrically using standard NaOH solution.
- c) Determination of cell constant of a conductivity cell.

Jamai-Osmania (PO), Secunderabad 500 007 INDIA

d) Verification of Ostwald's dilution law- Determination of dissociation constant (Ka) of acetic acid by conductivity measurements.

### 3. Colorimetry

- a) Verification of Beer's law and Determination of the concentration of KMnO<sub>4</sub> solution.
- b) Verification of Beer's law and Determination of the concentration of CuSO<sub>4</sub> solution.

### 4. Adsorption

b) Adsorption of acetic acid on animal charcoal - Verification of Freundlich adsorption isotherm.

### 5. Physical constants

b) viscosity of liquids. (Demonstration Experiment) a) Surface tension and



### **B.Sc. CBCS CHEMISTRY**

Theory Model Question Paper For

Semester I, II, III, IV

Max. Marks : 80

Note: Answer eight questions from Part-A and all questions from Part-B. Each question carries 4 marks in Part-A and 12 marks in Part-B.

Time :3Hrs.



### B.Sc. CBCS CHEMISTRY Practical Model Question Paper For Semester I, II, III, IV

Max. Marks :50

Time :3Hrs.

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SEMESTER	External (Marks)	Internal (Marks)	Total (Marks)
	40	10	50
П	40	10	50
III	40	10	50
IV	40	10	50

