FOUR YEAR UNDERGRADUATE PROGRAM (2024 - 28)

Department of CHEMISTRY

SEMESTER -1 (DSC, VAC, ME)

Course Curriculum +

Fernester - [& I]

FOUR YEAR UNDERGRADUATE PROGRAM (NEP-2020)

Program: Bachelor in Science

DISCIPLINE-CHEMISTRY

Session-2024-28

DSC- 01 to 08		DSE-01 to 12		DGE-01 to 06	
Code	Title	Code	Title	Code	Title
CHSC-01T	Fundamental Chemistry-I	CHSE-01T	Basic Analytical Chemistry	CHGE-01T	Fundamental Chemistry-I
CHSC-01P	Chemistry Lab. Course-I	CHSE-01P	Basic Analytical Chemistry Lab. Course	CHGE-01P	Chemistry Lab. Course-I Fundamental
CHSC-02T	Fundamental Chemistry-II	CHSE-02T	Environmental Chemistry	CHGE-02T	Chemistry-II Chemistry Lab.
CHSC-02P	Chemistry Lab. Course-II	CHSE-02P	Environmental Chemistry Lab. Course	CHGE-02P	Course-II
CHSC-03T	Inorganic and Physical Chemistry-I	CHSE-03T	Dyes & Polymer Chemistry		
CHSC-03P	Chemistry Lab. Course-III	CHSE-03P	Dyes & Polymer Chemistry Lab. Course		
CHSC-04T	Organic and Physical Chemistry-I	CHSE-04T	Heterocyclic Chemistry		
CHSC-04P	Chemistry Lab. Course-IV	CHSE-04P	Heterocyclic Chemistry Lab. Course		
CHSC-05T	Organic & Inorganic-I	CHSE-05T	Photochemistry & Pericyclic Reactions		,
CHSC-05P	Chemistry Lab. Course-V	CHSE-05P	Photochemistry & Pericyclic Reactions Lab. Course		
CHSC-06T	Organic and Physical Chemistry-II	CHSE-06T	Spectroscopy-I		
CHSC-06P	Chemistry Lab. Course-VI	CHSE-06P	Spectroscopy-I Lab. Course		
CHSC-07T	Inorganic & Physical Chemistry-II	CHSE-07T	Chemical Kinetics & Nuclear Chemistry		
CHSC-07P	Chemistry Lab. Course-VII	CHSE-07P	Chemical Kinetics & Nuclear Chemistry Lab. Course		
CHSC-08T	Organic & Inorganic-II	CHSE-08T	Electrochemistry & Surface Chemistry		
CHSC-08P	Chemistry Lab. Course-VIII	CHSE-08P	Electrochemistry & Surface Chemistry Lab. Course		
		CHSE-09T	Spectroscopy-II		
		CHSE-09P	Spectroscopy-II Lab. Course		
		CHSE-10T	Nanotechnology & Solid State	SEC	
		CHSE-10P (VIII SEM)	Nanotechnology & Solid State Lab. Course	13 25	
		CHSE-11T	Medicinal Chemistry & Natural Products	CHSEC- 01T&P	Chemical Analysis Techniques
		CHSE-11P	Medicinal Chemistry & Natural Products Lab. Course		
7		CHSE-12T	Instrumental Methods of Analysis	VAC	
	_	CHSE-12P	Instrumental Methods of Analysis Lab. Course	CHVAC- 01T	Chemistry in Dail

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FOUR YEAR UNDERGRADUATE PROGRAM(NEP-2020)

Program: Bachelor in Science DISCIPLINE-CHEMISTRY Session-2024-28 PO & PSO

PROGRAMME OUTCOMES (PO)

- PO-1: B.Sc. Chemistry curriculum is so designed to provide the students a comprehensive understanding about the fundamentals of chemistry covering all the principles and perspectives.
- PO-2: The branches of Chemistry such as Organic Chemistry, Inorganic Chemistry, Physical Chemistry and Analytical Chemistry expose the diversified aspects of chemistry where the students experience a broader outlook of the subject.
- PO-3: The syllabi of the B.Sc. Chemistry course are discretely classified to give stepwise advancement of the subject knowledge right through the four years of the term.
- PO-4: The practical exercises done in the laboratories impart the students the knowledge about various chemical reagents and reactions. They are also trained about the adverse effects of the obnoxious chemicals and the first aid treatment.

PROGRAMME SPECIFIC OUTCOMES (PSO)

- PSO-1: The students will understand the existence of matter in the universe as solids, liquids, and gases which are composed of molecules, atoms and sub atomic particles.
- PSO-2: Students will learn to estimate inorganic salt mixtures and organic compounds both qualitatively and quantitatively using the classical methods of analysis in practical classes.
- PSO-3: Students will grasp the mechanisms of different types of reactions both organic and inorganic and will try to predict the products of unknown reactions.

PSO-4: Students will learn to synthesize the chemical compounds by maneuvering the addition of reagents under optimum reaction conditions

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FOUR YEAR UNDERGRADUATE PROGRAM (2024 - 28) DEPARTMENT OF CHEMISTRY COURSE CURRICULUM

Pro Cer	ART- A:		E CURRICULUM		
Cer		ntroductio	n		
Cer	gram: Bachelor in	Science			
'	rtificate / Diploma / De	gree/Honors)	Semester - I	Session: 2024-	2025
	Course Code	CHSC-01T			
2	Course Title		ID A MEDIUM AND ADDRESS OF THE PARTY OF THE		
_	Course Type		DAMENTAL CHEMI	STRY-I	
_			DSC		
+	Pre-requisite (if, any)		As per F	Program	
		> To know	the contributions of anc	ient Indian scientists, stu	dy aton
		structure,	and periodic properties.		
	Course Learning.	> To explor	e the concept of chemica	al bonding, including ion	ic and
	Outcomes (CLO)	covalent t	oonding, hybridization, n	nolecular orbital theory a	ınd
4	o Lieb lines (Cho)		cular interactions.		
		their stoic	looui reaciion mechanis hiomatro	ms of inorganic reactions	s and
			tand basics principles of	forganic chamistry	
	Credit Value	3 Credits	Credit = 15 Hour	s - learning & Observa	tion
'	Total Marks	Max. Marks:	100	Min Passing Marks:	40
ΔF	RT -B: Conter	nt of the Co		Will I assing Walks.	40
_		ning-learning P	eriods (01 Hr. per peri	od) - 45 Periods (45 Ho	
Jnit	t .	Top	oics (Course contents	3)	No. o
ī	A. Chemistry in And	cient India: (a) C	hemical techniques in an	cient India: Caparal	Perio
	Introduction (b) Cont	ribution of ancien	it Indian scientists in cher	nistry e o metallurgy	
	ayes, pigments, cosm	etics, Ayurveda, (Charak Sanhita.		
	Ancient Indian Che	mist- Their Contr.	ibution and Books- Rishi	Kanad, Aacharya	
	Nagarjuna, Vagbhatta	i, Govindacharya,	Yashodhar, Ramchandra	, Somadava, Gopalbhatta	
	etc. Indian Chemist o	f 19th century- A	acharya Prafulla Chandra	Ray- His Contribution	
	and work for Indian (
	limitations Dual natu	and Periodic Pr	operties: (i) Review of E	Sohr's theory and its	1
	I Incertainty principle	and its significant	l waves, de Broglie's equ ce. (ii) Quantum numbers	ation, Heisenberg's	11
	Rules for filling electr	rons in various or	bitals, Pauli's Exclusion F	Principle Hund's rule of	
	maximum multiplicity	, Aufbau principl	e and its limitations. Elec	etronic configurations of	
	the atoms. Stability of	half-filled and co	impletely filled orbitals, of	concept of exchange	
	energy. Relative energy	gies of atomic orb	itals. Anomalous electron	nic configurations	
	(iii)Effective nuclear	charge (ENC), shi	elding or screening effec	t, Slater rules, Atomic	
	and lonic radii. Ioniza	tion energy and fa	actors affecting ionization	n energy. Electron	
	affinity, Electronegati	vity—Pauling's/N	Iulliken's electronegativit	y scales. Relation of	
		nypridization.			
77	chamical Randing	I A) Ionia Bandi			
п	Chemical Bonding -	I A) Ionic Bondi	ng: General characteristi	cs of ionic bonding	
n	Chemical Bonding – Ionic Bonding & End	I A) Ionic Bondi ergy: Lattice and	ng: General characteristicsolvation energies and the	cs of ionic bonding	
n	Chemical Bonding – Ionic Bonding & Enc context of stability and	I A) Ionic Bondi ergy: Lattice and a d solubility of ion	ng: General characteristics of solvation energies and the compounds.	cs of ionic bonding.	
n	Chemical Bonding — Ionic Bonding & Encontext of stability and Born-Haber Cycle as polarizing power and	I A) Ionic Bondi ergy: Lattice and a d solubility of ion ad its Application polarizability. Faj	ng: General characteristics of solvation energies and the ic compounds. as: Covalent character in an's rules.	cs of ionic bonding. eir importance in the ionic compounds,	12
TT .	Chemical Bonding — Ionic Bonding & Ene- context of stability and Born-Haber Cycle an polarizing power and B) Covalent Bonding	I A) Ionic Bondi ergy: Lattice and a d solubility of ion ad its Application polarizability. Faj. : Lewis structures	ng: General characteristics of solvation energies and the ic compounds. as: Covalent character in an's rules.	cs of ionic bonding. eir importance in the ionic compounds,	12
n	Chemical Bonding — Ionic Bonding & Eneron End of Stability and Born-Haber Cycle as polarizing power and B) Covalent Bonding and types with suitable	I A) Ionic Bondi ergy: Lattice and a d solubility of ion and its Application polarizability. Fajor: Lewis structures e examples), dipolarizability	ng: General characteristics of solvation energies and the ic compounds. as: Covalent character in an's rules. by Valence Bond theory, I be moment and percentage	cs of ionic bonding. eir importance in the ionic compounds, Hybridization (concept	12
II	Chemical Bonding — Ionic Bonding & Eneron End of Stability and Born-Haber Cycle as polarizing power and B) Covalent Bonding and types with suitable	I A) Ionic Bondi ergy: Lattice and a solubility of ion ad its Application polarizability. Fag.: Lewis structures e examples), dipolarizability polarizability in the polarizability is a structure of the polarizability.	ng: General characteristics of various energies and the compounds. as: Covalent character in an's rules. So Valence Bond theory, I be moment and percentageory (VSEPR) and structure.	cs of ionic bonding. eir importance in the ionic compounds, Hybridization (concept	12

India Just Akong

Chemical Bonding - II A) MO theory: LCAO method-criteria of orbital overlapping, types of molecular orbitals- σ -, π - and, δ -MOs; formation of σ - and π -MOs and their, schematic illustration; qualitative MO energy level diagram of homo- (N2 & O2(including peroxide, superoxide)) and hetero-diatomic molecules (NO, CO), magnetic properties, bond order and stability of molecules and ions. B) Weak Chemical Forces: van der Waals forces, ion-dipole forces, dipole-dipole interactions, ion-induced dipole interactions, dipole-induced dipole interactions. Repulsive forces, Hydrogen bonding (theories of hydrogen bonding, valence bond treatment). Ш A. Chemical properties of s-block metals Reaction with water, air, and nitrogen, Anomalous behavior of Li and Be, Compounds of s-block metals: Oxides, hydroxides, peroxides, and superoxides (preparation and properties) Complexes of s-block metals, Complexes with crown ethers B. Chemistry of p-Block Elements Boron group: Hydrides (classification of boranes), Diborane (preparation, properties, and structure elucidation), Borazine (preparation and structure) Carbon group: Carbides (salt-like carbides, interstitial carbides, covalent carbides), 11 Silicates (classification, three-dimensional silicates - properties and structures) Nitrogen group: Hydrides of Nitrogen (hydrazine, hydroxylamine, hydrazoic acid) Structure of oxides of nitrogen (N2O, NO, NO2, N2O4, and N2O5), Structure of oxyacids of nitrogen (HNO2, HNO3, H2N2O7,), Nitrides (classification, preparation, properties, and Structure of Oxides and oxoacids of phosphorus: (P2O3, P2O5) H3PO2, H3PO3, H3PO4, H₄P₂O₇ Halogen: Hydrides, Oxides and oxyacids of halogens (structure only) - Inter halogen compounds and pseudo halogens Electronic Effects in Organic Compounds IV Bond Cleavage: Homolytic and heterolytic cleavages, bond energy, bond length, and bond angle. Electron Displacement Effects: Inductive, inductomeric, electromeric, mesomeric (resonance), hyperconjugation, and steric effects. Tautomerism (keto-enol, amido-imidol, and nitro-acinitro forms). Reaction Intermediates: Formation and stability of carbocations, carbanions, free radicals, carbenes, nitrene and benzyne. B. Stereochemistry of Organic Compounds i) Optical Isomerism 11 Elements of symmetry, chirality, enantiomers, and optical activity, Chiral and achiral molecules with two stereogenic centers (Tartaric acid as an example), Erythro & Threo, Diastereomers and meso compounds, Inversion, retention, and racemization, Relative configuration (D/L), and absolute configuration (R/S nomenclature: sequence rules). ii) Geometrical Isomerism Geometric isomerism (cis-trans isomerism) in alkenes with examples (maleic acid, fumaric acid, and 2-butene), E/Z system of nomenclature. Ancient Indian Chemistry, Atomic Structure, Periodic Properties, Chemical Bonding, s- &p-block Keywords elements, Electronic effects, Stereochemistry Signature of Convener & Members (CBoS):

PART-C: **Learning Resources** Text Books, Reference Books and Others Text Books Recommended -Text Books

- 1. Puri, B. R., Sharma, L. R., & Kalia, K. C. (2018). Principles of Inorganic Chemistry. Nagin
- 2. Satyaprakash, G., Tuli, S. K., Basu, S. K., & Madan, R. D. (2017). Advanced Inorganic Chemistry (Vol. 1, 5th Ed.). S. Chand & Company.
- 3. Lee, J. D. (2010). Concise Inorganic Chemistry (5th Ed.). Blackwell Science.
- 4. Housecroft, C. E., & Sharpe, A. G. (2012). Inorganic Chemistry (4th Ed.). Pearson Education
- 5. Ray, Acharya Prafulla Charndra, History of Chemistry in Ancient And Medieval India, Chowkhamba Krishnadas Academy (Reprint 2004).

Reference Books

- 1. Cotton, F. A., Wilkinson, G., & Gaus, P. L. (2002). Basic Inorganic Chemistry (3rd Ed.). John
- 2. Douglas, B. E., Mcdaniel, D. T., & Alexander, J. J. (1994). Concepts and Models Of Inorganic Chemistry (3rd Ed.). John Wiley & Sons.
- 3. Huheey, J. E., Keiter, E. A., & Keiter, R. L. (1993). Inorganic Chemistry (4th Ed.). Harpercollins
- 4. Shriver, D. F., Atkins, P. W., & Langford, C. H. (2010). Inorganic Chemistry (5th Ed.). W. H. Freeman And Company.
- 5. Moeller, T. (1990). Inorganic Chemistry: A Modern Introduction. Wiley.

Online Resources-

- ▶ https://bit.ly/3AyV3mZ
- ▶ https://nptel.ac.in/courses/104/104/104104101/
- https://nptel.ac.in/courses/104/103/104103019/
- https://nptel.ac.in/courses/104/101/104101090/
- https://nptel.ac.in/courses/104/105/104105103/

Online Resources-

> e-Resources / e-books and e-learning portals

DART D. A.	in the care and	portats		The state of the s
FART -D: Asses	sment and Evalu	ation		
Suggested Continuous	Evaluation Methods:			
Maximum Marks:	100 M	arks		
Continuous Internal A	ssessment (CIA): 30 M:			
End Semester Exam (F	SE): 70 Ma			
Continuous Interna	Internal Test / Quiz-(2): 2	0.60		p.
Assessment (CIA):	Assignment / Seminar -		Better marks o	out of the two Test / Quiz
(By Course Teacher)	Total Marks -	10	+ obtained mar	ks in Assignment shall be
		30	considere	ed against 30 Marks
End Semester	Two section - A & B			
Exam (ESE):	Section A: Q1. Objective -	10 x1 = 10 N	Mark: O2. Short a	nswer type- 5x4 =20 Marks
		er type qts.,	lout of 2 from as	iswer type- 5x4 =20 Marks
rne and Signature of Conv	ener & Members of CBoS:		A O	ch unit-4x10=40 Marks
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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28) DEPARTMENT OF CHEMISTRY COURSE CURRICULUM

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-	ART		ntroductio	THE PERSON NAMED IN COLUMN 2 I		-
Pr <u>(Ca</u>	ograr <i>ertifica</i>	n: Bachelor ir te/Diploma/De	Science	Semester-I	Session: 2024-2	2025
	Cour	rse Code	CHSC-01P			
2	Contract of the Parket of the	rse Title		EMISTRY LAB. COUR	CT T	
3	THE RESERVE AND DESCRIPTION OF THE PERSON NAMED IN	гѕе Туре		DSC	5E-1	
4	Pre-	requisite (if, nny)		As per Program		
5	Commercial		 Analyze mixtures for cations (NII₄*, Pb^{2*}, etc.) & anions (CO₃^{2*}, S^{2*}, etc.) using H₂S or other methods. Perform titrimetric analysis (standardization, unknown conc. determination). Estimate the concentration of acetic acid in vinegar (using NaOH), alkali content in antacids (using IICl), and free alkali in soaps/detergents. Utilize complexometric titrations for calcium (Ca^{2*}) water hardness. 			
6	Cred	lit Value	Te /Te , una Cu			
7			To The Laboratory of Freia learning Fraint			
PA	RT -	B: Conte	nt of the Co		Min Passing Marks:	20
				ing/performance Period	ls: 30 Periods (30 Hours)	
Mo	odule			opics (Course content		No. of
			Period 30			
Key	words	Qualitative Analys	is (H ₂ S method, C	ations (NH4*, Pb2*, etc.), An ution), Concentration Deter	ions (CO12-, S2-, etc.), Titris	metric

Signature of Convener & Members (CBoS):

PART-C: **Learning Resources**

Text Books, Reference Books and Others

Textbooks Recommended:

- 1. Gurtu, J. N., & Kapoor, R. (1987). Experimental Chemistry. S. Chand & Co.
- 2. Bajpai, D. N., Pandey, O. P., & Giri, S. (2013). Practical Chemistry. S. Chand & Co.
- 3. Ahluwalia, V. K., Dhingra, S., & Dhingram, S. (2005). College Practical Chemistry. Universities
- 4. Kamboj, P. C. (2014). Advanced University Practical Chemistry (Part I). Vishal Publishing Co.
- 5. Fultariya, C., & Harsora, J. (2017). Volumetric Analysis: Concepts and Experiments.

Reference Books Recommended:

- 1. Mcpherson, P. A. (2015). Practical Volumetric Analysis. Royal Society Of Chemistry.
- 2. Shobha, R., & Banani, M. (2017). Essentials of Analytical Chemistry. Pearson.
- 3. Venkateswaran, V., Veeraswamy, R., & Kulandaivelu, A. R. (2004). Basic Principles Of Practical Chemistry (2nd Ed.). S. Chand Publications.
- 4. Sundaram, S., & Raghavan, K. (1996). Practical Chemistry. S. Viswanathan Co. Pvt.
- 5. Svehla, G. (2011). Vogel's Textbook of Inorganic Qualitative Analysis (7th Ed.). Pearson Education

Online Resources-

- https://bit.ly/3B7tOQV
- https://bit.ly/30V85ze
- https://bit.ly/3B5WOIQ
- https://bit.ly/3C9PXPS
- https://bit.ly/30Ip9rZ
- https://bit.ly/3BPnwqc

Online Resources-

e-Resources / e-books and e-learning portals

PART -D: Assessment and Evaluation						
Suggested Continuous	Suggested Continuous Evaluation Methods:					
Maximum Marks:	50 Marks		_			
Continuous Internal A	ssessment (CIA): 15 Marks					
End Semester Exam (E	ESE): 35 Marks					
Continuous Internal	Internal Test / Quiz-(2): 10 &	10 Better marks out of the	two Test / Quiz			
Assessment (CIA):	Assignment/Seminar +Attendance - (05 + obtained marks in Ass				
(By Course Teacher)		15 considered against				
End Semester	Laboratory / Field Skill Perform	nance: On spot Assessment	Managed by			
Exam (ESE):	A. Performed the Task based on		Course teacher			
(222)	B. Spotting based on tools & tech	hnology (written) – 10 Marks	as per lab.			
	C. Viva-voce (based on principle	c/technology) - 05 Marks	status			
On the state of Continue of Co						

Name and Signature of Convener & Members of CBoS:

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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28) DEPARTMENT OF CHEMISTRY COURSE CURRICULUM

P	ART- A:		E CURRICULUM	A	
		ntroductio	n		
P	rogram: Bachelor i	n Science			
C	ertificate / Diploma / De	oree/Honors)	Semester - I	Session: 2024	2025
1	Course Code	CHGE-01T		00051011. 2024	-2025
2	Course Title				
3	Course Type	FUN	NDAMENTAL CHEMI	STRY-I	
4			GE		
_	Pre-requisite (if, any)		As per P	Program	
		> To know	the contributions of anci	ient Indian saigntints at	ulu atam
5	Course Learning.	> 10 explor	e the concept of chemical	I honding in alasting	ic and
3	Outcomes (CLO)		viums, nyoriaizainon, n	nolecular orbital theory a	and
	13.	THE THEOLOGICA	culur inieracijons		
	111111111111111111111111111111111111111	their stoic	wout reaction mechanist	ms of inorganic reaction	s and
_		31010	monieny.		
5	Credit Value	3 Credits	Credit = 15 Hour	theories and solvent syst	em.
7	Total Marks	Max. Marks:	100	s - learning & Observa	
A	RT -B: Conten	t of the Co		Min Passing Marks:	40
	Total No. of Teac	hing-learning D	uise		
Jni	1	ang-learning P	eriods (01 Hr. per perio	od) - 45 Periods (45 Ho	urs)
		Тор	ics (Course contents) .	No. of
I	A. Chemistry in And	eient India: (a) Cl	nemical techniques in		Period
	The same tion (b) Conti	noution of ancien	Indian coientists in abou	nistry e.g. metalluman	
	J - , P - B - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1	CHUS. A VIII VERIA I	Darak Sanhita		
	Ancient Indian Chen	nist- Their Contri	hution and Books Dist.	Kanad, Aacharya	
	probaljulia, vagolialia	. Govindacharva	Yachodhar Damahandan	C 1 0	
	and work for Indian C	1 Jul Cellury- Aa	charya Prafulla Chandra	Ray- His Contribution	
	part work for maran C	HCHIISH V.			3 1
	limitations. Dual natur	e of particles and	operties: (i) Review of Bo waves, de Broglie's equa	ohr's theory and its	
	Onecitality principle a	ilia iis significanc	e (II) () Hantum numbers	- 141 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	11
	reason for training election	Jus ili various orn	Ifals Pauli's Evaluaion D.		
	promision and interpretation,	Autoau Di incinie	: and its limitations blood	trania and	
	are atoms. Stability of	naii-iiiied and coi	mpletely filled orbitals of	anaont of augl	
	chergy. Relative energy	ies of atomic orbit	tals. Anomalous electroni	in configuration	
	(iii)Effective nuclear ci	narge (ENC), shie	lding or screening effect	Slater miles At-	
	and forme radii. Ionizati	ion energy and fac	ctors affecting ionization	energy Floates	
	electronegativity with h	nyPauling's/Mi	ulliken's electronegativity	scales. Relation of	
I	Chemical Bonding - I	A) Ionic Rondin	g: General characteristics		
_	Ionic Bonding & Ener	gy: Lattice and so	olvation energies and thei	s of ionic bonding.	
	context of stability and	solubility of ionic	compounds	1	
	Born-Haber Cycle and	d its Applications	s: Covalent character in ic	onic compounds	
	polarizing power and po	olarizability. Faiai	n's rules.		
	B) Covalent Bonding:	Lewis structures,	Valence Bond theory, Hy	ybridization (concept	12
	and types with suitable	examples), dipole	moment and nercentage	ionia abanes	
	Valence shell electron p	air repulsion theo	ry (VSEPR) and structure	e of NH3, H2O, SF4,	
_	CIF ₃ , PCl ₅ , SF ₆ , XeF ₂ , X	ker6, AeO3, XeO1	'4, Xer4.		1
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	Chemical Bonding - II	1
1	A) MO theory: LCAO method-criteria of orbital, overlap, types of molecular orbitals-of	5
	π - and, δ -MOs; formation of σ - and π -MOs and their, schematic illustration; qualitati	
	MO energy, level diagram of homo- (N ₂ & O ₂ (including peroxide, superoxide)) as	
	hetero-diatomic molecules (NO, CO), magnetic properties, bond order and stability	01
	molecules and ions.	1
	B) Weak Chemical Forces: van der Waals forces, ion-dipole forces, dipole-dipole	1
. 12	interactions, induced dipole interactions, Instantaneous dipole-induced dipole	
	interactions. Repulsive forces, Hydrogen bonding (theories of hydrogen bonding, valence	e
	bond treatment).	
II	A. Chemical properties of s-block metals	
	Reaction with water, air, and nitrogen, Anomalous behavior of Li and Be, Compounds of	
9	s-block metals: Oxides, hydroxides, peroxides, and superoxides (preparation and	
	properties)	
	Complexes of s-block metals, Complexes with crown ethers	
- 1 m	B. Chemistry of p-Block Elements	1
	Boron group: Hydrides (classification of boranes), Diborane (preparation, properties,	
3	and structure elucidation). Porgains (properties), Diborate (preparation, properties,	ş-
	and structure elucidation), Borazine (preparation and structure)	
	Carbon group: Carbides (salt-like carbides, interstitial carbides, covalent carbides),	11
1	Silicates (classification, three-dimensional silicates - properties and structures)	
	Nitrogen group: Hydrides of Nitrogen (hydrazine, hydroxylamine, hydrazoic acid)	
	Structure of oxides of nitrogen (N ₂ O, NO, NO ₂ , N ₂ O ₄ , and N ₂ O ₅), Structure of oxyacids	
1	of nitrogen (HNO2, HNO3, H2N2O7,), Nitrides (classification, preparation, properties, and	
	uses)	
	Structure of Oxides and oxoacids of phosphorus: (P ₂ O ₃ , P ₂ O ₅) H ₃ PO ₂ , H ₃ PO ₃ , H ₃ PO ₄ ,	
	$H_4P_2O_7$	
	Halogen: Hydrides, Oxides and oxyacids of halogens (structure only) - Inter halogen	
1 1 1 1 1	compounds and pseudo halogens	
IV	Electronic Effects in Organic Compounds	
100	Bond Cleavage: Homolytic and heterolytic cleavages, bond energy, bond length, and	
	bond angle. Electron Displacement Effects: Inductive, inductomeric, electromeric,	
1	mesomeric (resonance), hyperconjugation, and steric effects. Tautomerism (keto-enol	
1000	amido-imidol, and nitro-acinitro forms). Reaction Intermediates: Formation and stability	
3 / 5	of carbocations, carbanions, free radicals, carbenes, nitrene and benzyne.	
i i	B. Stereochemistry of Organic Compounds	
5 -	i) Optical Isomerism	
4	Elements of symmetry, chirality, enantiomers, and optical activity, Chiral and achiral	11
	molecules with two stereogenic centers (Tartaric acid as an example), Erythreo & Threo,	7.
1	Diastereomers and meso compounds Inversion retestion and meso compounds Inversion retestion and meso compounds.	- 1
100	Diastereomers and meso compounds, Inversion, retention, and racemization, Relative	- 1
	configuration (D/L), and absolute configuration (R/S nomenclature: sequence rules). ii) Geometrical Isomerism	1
1	Geometric isomerism (sis trong isomerism):	
	Geometric isomerism (cis-trans isomerism) in alkenes with examples (maleic acid,	47
	fumaric acid, and 2-butene), E/Z system of nomenclature.	are l
	Anaissa Fadisa Charles Andrew Charles	
Keywords	Ancient Indian Chemistry, Atomic Structure, Periodic Properties, Chemical Bonding, s- &p-block	
	elements, Electronic effects, Stereochemistry	
Signatu	re of Convener & Members (CBoS):	
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Signature of Convener & Members (CBoS):

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PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended -

Text Books

- 1. Puri, B. R., Sharma, L. R., & Kalia, K. C. (2018). Principles of Inorganic Chemistry. Nagin Chand and Co., New Delhi.
- Satyaprakash, G., Tuli, S. K., Basu, S. K., & Madan, R. D. (2017). Advanced Inorganic Chemistry (Vol. 1, 5th Ed.). S. Chand & Company.

3. Lee, J. D. (2010). Concise Inorganic Chemistry (5th Ed.). Blackwell Science.

4. Housecroft, C. E., & Sharpe, A. G. (2012). Inorganic Chemistry (4th Ed.). Pearson Education

Reference Books

- 1. Cotton, F. A., Wilkinson, G., & Gaus, P. L. (2002). Basic Inorganic Chemistry (3rd Ed.). John Wiley & Sons.
- 2. Douglas, B. E., Mcdaniel, D. T., & Alexander, J. J. (1994). Concepts and Models Of Inorganic Chemistry (3rd Ed.). John Wiley & Sons.
- 3. Huheey, J. E., Keiter, E. A., & Keiter, R. L. (1993). Inorganic Chemistry (4th Ed.). Harpercollins College Publishers.
- 4. Shriver, D. F., Atkins, P. W., & Langford, C. H. (2010). Inorganic Chemistry (5th Ed.). W. H. Freeman And Company.
- 5. Moeller, T. (1990). Inorganic Chemistry: A Modern Introduction. Wiley.

Online Resources-

- https://bit.ly/3AyV3mZ
- https://nptel.ac.in/courses/104/104/104104101/
- https://nptel.ac.in/courses/104/103/104103019/
- https://nptel.ac.in/courses/104/101/104101090/
- https://nptel.ac.in/courses/104/105/104105103/

Online Resources-

> e-Resources / e-books and e-learning portals

	to books and creating portais					
PART -D: Assessment and Evaluation						
Suggested Continuou	s Evaluation Methods:					
Maximum Marks:	100 Marks					
Continuous Internal	Assessment (CIA): 30 Marks					
End Semester Exam (End Semester Exam (ESE): 70 Marks					
	al Internal Test / Quiz-(2): 20,420	Better marks out of the two Test / Quiz				
Assessment (CIA):		+ obtained marks in Assignment shall be				
(By Course Teacher)	Total Marks - 30	considered against 30 Marks				
End Semester	Two section - A & B	considered against 30 Marks				
Exam (ESE):	Section A: Q1. Objective $-10 \times 1 = 10$	Mark; Q2. Short answer type- 5x4 =20 Marks				
	Section B: Descriptive answer type qts	s.,1out of 2 from each unit-4x10=40 Marks				

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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28) DEPARTMENT OF CHEMISTRY COURSE CURRICULAR

			Cours	SE CURRICULU	M	
			ntroductio	on		
P ₁	ertific	im: Bachelor in cate / Diploma / De	n Science	Semester - I	Session: 2024	-2025
2	Cot	irse Code	CHGE-01P		1 1	
3	_	irse Title	Che	emistry Lab. Course-I		
4		ırse Type		GE		
_	Pre	-requisite (if, any)	,	As per Program		
5	 Analyze mixtures for cations (NH₄*, Pb^{2*}, etc.) & anions (CO₃ etc.) using H₂S or other methods. Perform titrimetric analysis (standardization, unknown conc. determination). Estimate the concentration of acetic acid in vinegar (using Na alkali content in antacids (using HCl), and free alkali in soaps/detergents. Utilize complexometric titrations for calcium (Ca^{2*}), water hard 			юН),		
6	Cre	dit Value	Fe ²⁺ /Fe ³⁺ , and Cu ²⁺ . 1 Credits Credit = 30 Hours Laboratory or Field learning/Training			Trainin
7 70		Max. Marks:	50	Min Passing Marks:		
A	RT -	B: Conter	nt of the Co		Will I assing Walks.	20
					ds: 30 Periods (30 Hours)
	dule		To	pics (Course conten	ts)	No. of Period
Lab./Field Training/ Experiment Contents of Course Cations: NH ₄ +, Pb ²⁺ , Bi ³⁺ , Cu ²⁺ , Cd ²⁺ , Fe ²⁺ /Fe ³⁺ , Al ³⁺ , Co ²⁺ , Ni ²⁺ , Mn ²⁺ , Zn ²⁺ , Ba ²⁺ , Sr ²⁺ , Ca ²⁺ , Na ⁺ Anions: CO ₃ ²⁻ , S ²⁻ , SO ₄ ²⁻ , NO ₃ ⁻ , CH ₃ COO ⁻ , Cl ⁻ , Br ⁻ , I ⁻ , NO ₂ ⁻ , SO ₃ ²⁻ (Spot tests may be used wherever feasible.) TITRIMETRIC ANALYSIS Standardize sodium hydroxide solution using a standard oxalic acid solution. Determine the concentration of hydrochloric acid (HCl) solution using standardized sodium hydroxide solution as an intermediate.						
Кеун	vords	Qualitative Analysis	(H2S method, Cat		ons (CO ₃ 2-, S2-, etc.), Titrim nination (HCl solution)	etric
_				0		-

Signature of Convener & Members (CBoS):

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Learning Resources

Text Books, Reference Books and Others

Textbooks Recommended:

- 1. Gurtu, J. N., & Kapoor, R. (1987). Experimental Chemistry. S. Chand & Co.
- Bajpai, D. N., Pandey, O. P., & Giri, S. (2013). Practical Chemistry. S. Chand & Co.
- 3. Ahluwalia, V. K., Dhingra, S., & Dhingram, S. (2005). College Practical Chemistry. Universities
- 4. Kamboj, P. C. (2014). Advanced University Practical Chemistry (Part I). Vishal Publishing Co.
- 5. Fultariya, C., & Harsora, J. (2017). Volumetric Analysis: Concepts and Experiments.

Reference Books Recommended:

- 1. Mcpherson, P. A. (2015). Practical Volumetric Analysis. Royal Society Of Chemistry.
- 2. Shobha, R., & Banani, M. (2017). Essentials of Analytical Chemistry. Pearson.
- 3. Venkateswaran, V., Veeraswamy, R., & Kulandaivelu, A. R. (2004). Basic Principles Of Practical Chemistry (2nd Ed.). S. Chand Publications.
- 4. Sundaram, S., & Raghavan, K. (1996). Practical Chemistry. S. Viswanathan Co. Pvt.
- 5. Svehla, G. (2011). Vogel's Textbook of Inorganic Qualitative Analysis (7th Ed.). Pearson Education

Online Resources-

- https://bit.ly/3B7tOQV
- https://bit.ly/30V85ze
- https://bit.ly/3B5WOIQ
- https://bit.ly/3C9PXPS
- https://bit.ly/30Ip9rZ
- https://bit.ly/3BPnwqc

Online Resources-

> e-Resources / e-books and e-learning portals

PART-D: Assessment and Evaluation Suggested Continuous Evaluation Methods: **Maximum Marks:** 50 Marks Continuous Internal Assessment (CIA): 15 Marks End Semester Exam (ESE): 35 Marks Continuous Internal Internal Test / Quiz-(2): 10 & 10 Better marks out of the two Test / Quiz Assessment (CIA): Assignment/Seminar +Attendance - 05 + obtained marks in Assignment shall be (By Course Teacher) Total Marks considered against 15 Marks Laboratory / Field Skill Performance: On spot Assessment **End Semester** Managed by A. Performed the Task based on lab. work Exam (ESE): - 20 Marks Course teacher B. Spotting based on tools & technology (written) - 10 Marks as per lab. C. Viva-voce (based on principle/technology) - 05 Marks status

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Semester I(VAC)

FOUR YEAR UNDERGRADUATE PROGRAM(2024 – 28) DEPARTMENT OF CHEMISTRY

P	ΔE	T	Cours	E CURRICULUM		
D		T-A: Introdu	ction			
1.1	ogi	am:Bachelor in	Salamas			-
C	Critificate / Diploma / D.		eree/Honors	Semester-I/III/V	Session: 2024-2	025
	Co	ourse Code	CHVAC		Dession. 2024-2	.025
2	Co	ourse Title	CHVAC			
3	Agreement and	ourse Type		Chemistry in Da	ily Life	
4			Valu	e Added Course(VAC)		
-	11	·e-requisite(if,any)		As per Progra	1111	
5 Course Learning Outcomes(CLO)		ourse Learning utcomes(CLO)	To introduce the student about dairy product, beverages, food additives, artificial sweeteners, flavors, food colorants, paints, pigments, dyes etc. To make aware the students about air pollution, hydrological cycle, composition of soil, fertilizers etc. To introduce the students about carbohydrate, vitamins, drugs. To introduce students about concept of thermodynamics used in day to			yes etc. cle,
6	C	redit Value	aay nje.	Y		
7	To	otal Marks	2 Credits		-learning & Observati	on
ΡΔ			Max.Marks:50		Min Passing Marks:20	
		-B: Content	of the Cour	se		
		TotalNo.of Teacl	hing-learning Pe	eriods(01 Hr. per period)	- 30 Periods (30 Hours	s)
Ur		1 2	Topics(Course contents) Composition of milk and milk products. Analysis of fat content,		No. of Period	
		Beverages: Analys chloral hydrate in to Food additives, ad propionates, sorbate Artificial sweetene Flavors: Vanillin, a food colorants: Coapesticide residues in Paints & Pigments yellow and green pi Emulsion, latex; lur Solvents and thinne Dyes: Colour and co	d butter. Estimation is of caffeine in cooling of caffeine in caffeine	on of added water in milk. offee and tea, detection of of methyl alcohol in alcohol ntaminants: Food preserva charin, dulcin, sucralose an lavours) and monosodium -permitted colours and met (white lead, ZnO, lithopon d distempers: Requirement Fire retardant paints and en onic concept). Classification al study of azo dyes, Morda	chicory in coffee, lic beverages. atives like benzoates, d sodium cyclamate. glutamate. Artificial tallic salts. Analysis of le, TiO ₂). Blue, red, of a good paint. amels, lacquers. on of dyes. Methods of	08
II Air P Ozone source Hydro Public turbid nitrate Water enviro		Ozone hole and CFO sources. Bhopal gas in Hydrologic cycle, so Public health signiful turbidity, total solids nitrate, BOD and CO Water purification environment. Detergation aspects. H	C's. Photochemical tragedy. ources, criteria and icance and meas a acidity, alkalinity. for drinking and ents - pollution as leavy metal pollu	tion and control, Greenhood smog and PAN. Catalyted standards of water quality urement of water quality ty, hardness, sulphate, flucted industrial purposes. To spects, eutrophication. Pestation. Solid pollutants -	ic converters for mobile ty - safe drinking water. parameters - (Colour, oride, phosphate, nitrite, oxic chemicals in the icides and insecticides -	07

	Committee	
	Composition of soil - inorganic and organic components in soil - micro and macronutrients.	d
	Fertilizers: Classification of fertilizers - Straight Fertilizers, Compound/Complex Fertilizers, Fertilizer Mixtures Manufacture and convert	
]
III		1
111	Carbohydrates: Structure, function and Chemistry of some important mono and disaccharides.	-
		1
	Vitamins: Classification and Nomenclature. Sources, deficiency diseases and structures of Vitamin A. Vitamin B. Vitamin B	
	1 Vitamin D. Villiamin B. Villamin D. Vitamin D. Vitamin D. Vitamin D. Vitamin	
		1
	Drugs: Classification and nomenclature.	1
	Structure and function of: Analogy ics —aspirin paragetemal	1
	Time mente arup: menendazole	08
	Antiallergic drug; Chloropheneramine maleate	•
	Antibiotics: Penicillin V. Chloromycetin Streptomycin	1
	Anti-infairmatory agent: Oxypheno-butazone	
	Animalarials: Primazuine phosphate & Chloroquine	
	Uns and lats: Composition of edible oils, detection of purity, rancidity of fats and	
	on. Tests for adulterants like aregemone oil and mineral oils	
IV	Soaps & Detergents: Structures and methods of use of soaps and detergents.	
TA	Chemical Thermodynamics: Concept of fugacity and free energy. Activity and	
	activity coefficient, spontaneity of processes-entropy and free energy changes. Partial	
ű i	moial quantities, colligative properties. Le-Chatelier principle, phase equilibrium	
-	Enzyme catalyzed reactions.	
No.	Principles of Reactivity: Basis kinetic concepts, rates of simple and complex	
	chemical reactions, empirical rate equations. Temperature dependence of rates and	08
	activation parameters. Branched chain reactions – explosion limits. Oscillatory reactions.	00
=	Chemical energy system and limitations, principles and applications of primary &	
	secondary batteries and fuel cell. Basics of solar energy, future energy storer. aerospace materials. Problems of plastic waste management. Strategies for the	
	development of environment friendly polymers.	
	Air pollution, carbohydrate, vitamins, LeChatteliar's law, Dairy product, artificial sweeteners.	
ywords	fertilizers, Paint, pigment, dyes.	
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PART-C:Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

- 1. Sharma, B. K. (1998). Introduction to Industrial Chemistry. Meerut: Goel Publishing.
- 2. Many, N. S., & Swamy, S. (1998). Foods: Facts and Principles (4th ed.). New Age International.
- 3. Kar, A. (2022). Medicinal Chemistry. NEW AGE International Pvt Ltd Reference books Recommended:
- 1. Drugs and Pharmaceutical Sciences Series. (Year). Marcel Dekker, Vol. II. New York: INC.
- 2. Atkins, P., & de Paula, J. (2002). Physical Chemistry (7th ed.). Oxford University Press.
- 3. Swaminathan, & Goswamy. (2001). Handbook on Fertilizer Technology (6th ed.). FAI.
- 4. Finar, I. L. (Year). Organic Chemistry (Vol. 1&2).
- 5. Fired, J. R. (Year). Polymer Science and Technology. Prentice Hall.

Online Resources:

Exam (ESE):

https://onlinecourses.swayam2.ac.in/nos22 sc23/preview

https://www.researchgate.net/publication/343585969 Chemistry in Everyday Life

https://www.youtube.com/watch?v=P3p1C87gc0U

https://www.slideshare.net/sanjaijosephManesh/food-chemistry-51688453

PART-D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks

Continuous Internal Assessment(CIA):15 Marks

End Semester Exam(ESE):35Marks						
Continuous	Internal Test / Quiz-(2): 10 £10	Better marks out of thetwo Test /				
InternalAssessment	Assignment/Seminar +Attendance- 05	Quiz+obtained marks in Assignment				
(CIA):	otal Marks -15	shall be considered against 15 Marks				
(By Course Teacher)	A 1	*				
End Semester	Two section – A & B					
Exam (ESE):	Section A: Q1. Objective - 05 x1= 05 Mark; Q2. Short answer type- 5x2 =10Marks					

Name and Signature of Convener & Members of CBoS:

Section B: Descriptive answer type qts., 1 out of 2 from each unit-4x05=20Marks