

U.P. STATE GOVERNMENT UNIVERSITY, (Recognised Under Section 2(f) & 12(B) of the UGC Act, 1956 & B.Tech. Approved by (AICTE)

Programme	e/Class: Diploma	Year: Second		Semester: Third		
Subject: Ch	emistry					
Course Cod	le: B020301T	Course Title: Chemic	al Dynamic	cs & Coordination (	Chemistr	у
Course Out	tcomes:			]	Bloom T	axonomy
• CO1.	Upon successful cor	npletion of this course	students sh	ould be able to		K2, K4
describe the characteristic of the three states of matter and describe the different						
physica	al properties of each	state of matter.				
• CO2. I	Kinetic theory of gas	ses, laws of crystallogra	phy, liquid	state and liquid		K4, K6
crystals	s, conductometric,	potentiometric, optical	methods, p	polarimetry and		
spectro	photometer techniq	ue to study Chemica	l kinetics	and chemical		
equilib	rium.					
• CO3. /	After the completion	of the course, Students	will be ab	le to understand		K4, K5
metal-	ligand bonding in tra	nsition metal complexes,	thermodyn	amic and kinetic		
aspects	of metal complexes					
Credits: 4			Core: Co	mpulsory		
Max. Mark	<b>s:</b> 25+75		Min. Pass	sing marks: as per	rules	
Total No. of	Lectures-Tutorials-	Practical (in hours per we	eek):L-T-P	:4-0-0		
Unit		Tonic	, rs			Total No
		- 0 0				of Lectures/
						Hours (60)
Ι	Chemical Kinetic	s: Rate of a reaction,	molecularit	ty and order of re	action,	10
	concentration dep	endence of rates, mat	thematical	characteristic of	simple	
	chemical reactions	– zero order, first order,	second ord	ler, pseudo order, h	alf-life	
	and mean life. De	termination of the orde	er of reaction	on – differential n	nethod,	
	method of integrati	on, half-life method and	isolation n	nethod.		
	Theories of chem	nical kinetics: Effect of	of tempera	ture on rate of re	action,	
	Arrhenius equation	, concept of activation e	energy. Sim	ple collision theory	/ based	
	on hard sphere model, transition state theory (equilibrium hypothesis).					



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	Expression for the rate constant based on equilibrium constant and thermodynamic aspects (no derivation).	
II	<b>Chemical Equilibrium:</b> Equilibrium constant and free energy, thermodynamic derivation of law of mass action. Le-Chatelier's principle. Reaction isotherm and reaction isochore - Clapeyron Clausius equation and its applications.	5
III	<b>Phase Equilibrium:</b> Statement and meaning of the terms-phase, component and degree of freedom, derivation of Gibbs phase rule, phase equilibria of one component system – water, CO <sub>2</sub> and S systems. Phase equilibria of two component systems – Solid - liquid equilibria , simple eutectic – Bi-Cd, Pb-Ag systems.	5
IV	<ul> <li>Kinetic theories of gases:</li> <li>Gaseous State: Postulates of kinetic theory of gases, deviation from ideal behavior, van der Waals equation of state.</li> <li>Critical phenomena: PV isotherms of real gases, continuity of states, the isotherms of Van der Waals equation, relationship between critical constants and Van der Waals constants, the law of corresponding states, reduced equation of state.</li> <li>Molecular Velocities: Qualitative discussion of the Maxwell's distribution of molecular velocities, collision number, mean free path and collision diameter.</li> </ul>	10
V	<ul> <li>Liquid State Liquid State: Intermolecular forces, structure of liquids (a qualitative description). Structural differences between solids, liquids and gases. Liquid crystals: Difference between liquid crystal, solid and liquid. Classification, structure of nematic and cholesterol phases.</li> <li>Liquids in solids (gels): Classification, preparation and properties, inhibition, general applications.</li> </ul>	5
VI	Coordination Chemistry:	5



	Werner's theory of coordination complexes classification of ligands	
	ambidanteta liganda abalatas acordination numbers HIDAC nomanalatura of	
	amoldentate figands, cherates, coordination numbers, fOPAC nomenciature of	
	coordination complexes (up to two metal centers), Isomerism in coordination	
	compounds, constitutional and stereoisomerism, geometrical and optical	
	isomerism in square planar and octahedral complexes.	
VII	Theories of Coordination Chemistry:	10
	<b>I.</b> Metal- ligand bonding in transition metal complexes, limitations of valance	
	bond theory, an elementary idea of crystal field theory, crystal field splitting in	
	octahedral, tetrahedral and square planner complexes, John teller effect, factors	
	affecting the crystal-field parameters.	
	<b>II.</b> Thermodynamic and kinetic aspects of metal complexes: A brief outline of	
	thermodynamic stability of metal complexes, concept of hard and soft acids and	
	bases and factors affecting the stability, stability constants of complexes and their	
	determination, substitution reactions of square planar complexes.	
VIII	Inorganic Spectroscopy and Magnetism:	10
	I. Electronic spectra of Transition Metal Complexes Types of electronic transitions,	
	selection rules for d-d transitions, spectroscopic ground states, spectrochemical	
	series, Orgel-energy level diagram for d <sup>1</sup> and d <sup>9</sup> states, discussion of the electronic	
	spectrum of $[Ti(H_2O)_6]^{3+}$ complex ion.	
	II. Magnetic properties of transition metal complexes, types of magnetic behaviour,	
	methods of determining magnetic susceptibility, spin-only formula, L-S coupling,	
	correlation of $\mu$ s and $\mu$ eff values, orbital contribution to magnetic moments,	
	application of magnetic moment data for 3d- metal complexes.	



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#### **Suggested Readings:**

- 1. Atkins, P. W. & Paula, J. de Atkin's Physical Chemistry Ed., Oxford University Press 13 (2006)
- 2. Ball, D. W. Physical Chemistry Thomson Press, India (2007).
- 3. Castellan, G. W. Physical Chemistry 4th Ed. Narosa (2004).
- 4. Cotton, F.A, Wilkinson, G and Gaus, P. L, Basic Inorganic Chemistry, 3 rd Edition, Wiley 1995

5. Lee, J.D, Concise Inorganic Chemistry 4 th Edition ELBS, 1977

6. Douglas, B, McDaniel , D and Alexander, J , Concepts of Models of Inorganic Chemistry, John Wiley & Sons; 3rd edition , 1994

7. Shriver, D.E Atkins, P.W and Langford, C.H., Inorganic Chemistry, Oxford University Press, 1994.

8. Porterfield, W.W, Inorganic Chemistry, Addison Wesley 1984.

9. Sharpe, A.G, Inorganic Chemistry, ELBS, 3 RD edition, 1993

- 10. Miessler, G.L, Tarr, D.A, Inorganic Chemistry, 2 nd edition, Prentice Hall, 2001
- 11. Bahl and Bahl, Essential of Physical Chemistry, S.Chand

12. R Gopalan & V Ramalingam, Concise Coordination Chemistry, Vishal publishing house

13.TN SRIVASTVA AND PC KAMPOJ, SYSTEMATIC NALYTICAL CHEMISTRY, SHOBAN LAL NAGIN CHAND Note:

Suggestive digital platforms web links-

- https://swayam.gov.in/
- https://www.coursera.org/learn/physical-chemistry
- <u>https://www.mooc-list.com/tags/physical-chemistry</u>
- https://www.openlearning.com/courses/introduction-to-physical-chemistry/
- <u>https://www.my-mooc.com/en/categorie/chemistry</u>
- <u>https://onlinecourses.swayam2.ac.in/nce19\_sc15/preview</u>
- https://swayam.gov.in/
- https://www.coursera.org/browse/physical-science-and-engineering/chemistry



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This course can be opted as an elective by the students of following subjects: Open for all

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**Course prerequisites:** To study this course, a student must have had the subject "Chemistry in II Semester of certificate course in Chemistry

Suggested Continuous Evaluation Methods House Examination/Test:10 marks

Written Assignment/Presentation/Project/Research Orientation/Term papers/Seminar: 10 Marks

Classperformance/Participate: 5 Marks

Further Suggestions: None



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Programm	e/Class: Diploma	Year: Second		Semester: Third		
Subject: Cl	nemistry					
Course Co	<b>de:</b> B020302P	Course Title: Physic	al Analysis	;		
Course Ou	tcomes:			I	Bloom	Taxonomy
• CO1	· Upon successful co	mpletion of this cour	se students	s should be able to		K1-K5
calib	calibrate apparatus and prepare solutions of various concentrations, estimation of					
comp	ponents through volur	netric analysis; to perf	form dilato	metric experiments:		
one a	and two component ph	ase equilibrium experir	nents.			
Credits: 2			Core: Co	mpulsory		
N/N/1	05 - 75		Mer Dra		1	
Max. Mark	<b>(S:</b> 25+75		Min. Pas	sing marks: as per ru	lles	
Total No. of	f Lectures-Tutorials-Pr	actical(in hours per wee	ek): <b>L-T-P:</b>	0-0-2		
S. No.		Objecti	ves			Total No. of
						Lectures/ Hours (60)
1	Strengths of Solution	n:				20
-			1. 1			_0
	Calibration of fraction	onal weights, pipettes a $0.1 \text{ M}$ to $0.001 \text{ M}$ solution	ions Mole	es. Preparation of sta	ndards	
	Units: Mole Concept	t molecular weight fo	rmula wei	oht and equivalent y	veight	
	Concentration units:	Molarity Formality	Normality	y Molality Mole fr	action	
	Percent by weight, Pe	ercent by volume, Parts	s per thousa	and, Parts per million	n, Parts	
	per billion, <i>p</i> H, <i>p</i> OH,	milli equivalents, Mill	i mole.	, <b>1</b>	,	
2	Surface Tension and	l Viscosity:				06
	Determination of surf	face tension of pure liqu	uid or solut	ion 2. Determination	of	
	viscosity of liquid pu	re liquid or solution.				
3	Boiling point and Tr	ansition Temperature	2:			14
		_				
	Boiling point of com	mon organic liquid co	mpounds A	NY FIVE] <i>n</i> -butyl a	lcohol,	
	cyclohexanol, ethyl n	nethyl ketone, cyclohez	kanone, ace	etylacetone, isobutyl	methyl	
	ketone, isobutyl alco	onol, acetonitrile, benz	aldehyde a	and acetophenone. [H	301ling	
	points of the chosen of	organic compounds sho	uia prefera	biy be within 180 °C	J.	
	2. Transition Tempera	ature, Determination of	the transiti	on temperature of the	given	

	substance by thermometric /dialometric method (e.g. MnCl <sub>2</sub> .4H <sub>2</sub> O/SrBr <sub>2</sub> .2H <sub>2</sub> O).	
4	Phase Fauilibrium:	20
-	Thase Equilibrium.	20
	To study the effect of a solute (e.g. NaCl, succinic acid) on the critical solution	
	temperature of two partially miscible liquids (e.g. phenol-water system) and to	
	determine the concentration of that solute in the given phenol-water system.	
	To construct the phase diagram of two component (e.g. diphenylamine -	
	benzophenone) system by cooling curve method.	
Suggested	readings:	
1. Skoo colle	og D. A., West. D. M. and Holler .F. J., "Analytical Chemistry: An Introduction", 7 <sup>th</sup> ge publishing, Philadelphia, (2010).	edition, Saunders
2. Larr	ry Hargis. G" Analytical Chemistry: Principles and Techniques" Pearson©(198)	
Digi	tal links:	
	1. https://www.labster.com/chemistry-virtual-lab	
	• 2. https://www.vlab.co.in/broad-area-chemical-sciences	
•	3. http://chemcollective.org/vla	
This course	can be opted as an elective by the students of following subjects: Open for all	
Course pre certificate c	<b>requisites:</b> To study this course, a student must have had the subject "Chemistry" in ourse in chemistry	II Semester of
Suggested	Continuous Evaluation MethodsHouse Examination/Test:10 marks	
Written As	signment/Presentation/Project/Research Orientation/Term papers/Seminar: 10	Marks

Classper formance/Participate: 5 Marks



रूवाजा मुईनुद्दीन चिश्ती भाषा विश्वविद्यालय, लखनऊ, उत्तर प्रदेश (भारत) Khwaja Moinuddin Chishti Language University, Lucknow, U.P. (India) L.P. STATE GOVERNMENT UNIVERSITY, (Recognised Under Section 2(f) & 12(B) of the UGC Act, 1956 & B.Tech. Approved by (AICTE)

Programme/	Class: Diploma	Year: Second	Semester: T	hird/fou	ırth	
Subject: Cher	mistry					
<b>Course Code</b>	<b>:</b> B020203T	Course Title: Fundamenta	ls of Organic Chem	istry		
Course Outco	omes:			Bloom	Taxonomy	
• CO1. very i	This course covers a fe mportant for students of	ew important topics organic cognate departments of che	chemistry that are mistry.		K1-K3	
CO2.     chemi     reaction	This course will introdu stry electronic displac	ce the students with the funds cement, bond fission and	amentals of organic types of organic		K2-K4	
• CO3. overa	• <b>CO3.</b> This course gives a broader theoretical picture in multiple stages in an overall chemical reaction.					
• CO4. bonds	It describes reactive inter- broken and formed.	ermediates, transition states	and states of all the		K2-K4	
• CO5. major	It enables to understand and minor products of a	nd the reactants, catalyst, st any organic reaction.	tereochemistry and		K2-K5	
• CO6. hydro	It also discusses the carbons and their impor	brief introduction of aliph tant reactions.	natic and aromatic		K4-K6	
Credits: 4		Core	e: GE-2/Minor Elec	tive-2		
Max. Marks	<b>s:</b> 25+75	Min	. Passing marks: a	s per rul	les	
Total No. of	Lectures-Tutorials-Prac	tical(in hours per week): L-I	Г <b>-Р:</b> 4-0-0			
Unit		Topics			Total No. o Lectures/ Hours (60)	)f
Ι	General Organic Chemi	istry:			12	
	Hybridization, Inductiv hyperconjugation, Hydi suitable examples. El basicity, Reactive intern Carbenes and nitrenes) mechanism: Addition, E	e, electromeric, resonance rogen bonding, Homolytic a ectrophiles and Nucleoph mediates ( <i>i.e.</i> Carbocations, ). Introduction to types of o Elimination and Substitution	e and mesomeric nd Heterolytic fissio iles, Nucleophilici Carbanions, Free r rganic reactions ar reactions.	effects, on with ty and adicals, nd their		
II	Stereochemistry: Conformations with responses of Wedge Formula, New of chirality (upto two c isomerism; Enantiomed Threo/erythro; D/L and chiral carbon atoms) an	pect to ethane, butane and cyowmann, Sawhorse and Fische arbon atoms). Configuration erism, Diastereomerism a d cis/trans nomenclature; Cl d E/Z Nomenclature (for upt	clohexane. Intercon er representations. C a: Geometrical and and Meso comp IP Rules: R/S (for to two C=C systems	version Concept Optical ounds). upto 2	12	
III	Aliphatic Hydrocarbo Alkanes: Preparation, C Reactions, Kolbe's syn substitutions: Halogena Alkenes: Preparation, dehydrohalogenation of	ns: Catalytic hydrogenation, Wü thesis, from Grignard reagen tion. Elimination reactions, Deh f alkyl halides (Saytzeff's ru	irtz Reaction, Würt nt. Reactions: Free ydration of alcoho ule). Reactions of a	z-Fittig radical ols and lkenes:	18	



# रूवाजा मुईनुद्दीन चिश्ती भाषा विश्वविद्यालय, लखनऊ, उत्तर प्रदेश (भारत) Khwaja Moinuddin Chishti Language University, Lucknow, U.P. (India) L.P. STATE GOVERNMENT UNIVERSITY, (Recognised Under Section 2(f) & 12(B) of the UGC Act, 1956 & B.Tech. Approved by (AICTE)

		cis-addition (alk. KMnO <sub>4</sub> ) and trans-addition (bromine), Addition of HX	
		(Markownikoff's and anti Markownikoff's addition), Hydration, Ozonolysis,	
		oxymecuration-demercuration, Hydroboration-oxidation.	
		Alkynes: Preparation (from $CaC_2$ , dehalogenation of tetra halides and	
		dehydrohalogenation of vicinal-dihalides). Reactions: formation of metal	
		acetylides, addition of bromine and alkaline KMnO4, ozonolysis and oxidation	
	117	with not alkaline KivinO <sub>4</sub> .	10
	IV	Aromatic Hydrocarbons, Aikyl and Aryl Halldes:	18
		substitution: nitration halogenation and sulphonation Eriedel-Craff's	
		reaction	
		Alkyl Halides (Unto five Carbons): Preparation: from alkenes and alcohols	
		Reactions: Nucleophilic Substitution ( $SN_1$ , $SN_2$ and $SN_3$ ) reactions.	
		Aryl Halides: Preparation of Chloro, bromo and iodo-benzene from phenol,	
		Sandmeyer & Gattermann reactions. Aromatic nucleophilic substitution	
		(replacement by –OH group) and effect of nitro substituent in Chlorobenzene.	
		Benzyne Mechanism: KNH <sub>2</sub> /NH <sub>3</sub> (or NaNH <sub>2</sub> /NH <sub>3</sub> ).	
Sugge	ested R	eadings:	
1.	Solor	nons, T. W. G.; Fryhle, C. B., Organic Chemistry, 11th Ed., Wiley India (2015).	
2.	Bruic	e, P. Y., Organic Chemistry, 7 <sup>th</sup> Ed., Pearson Education India (2013).	
3.	Bahl,	B. S.; Bahl, A., A Textbook of Organic Chemistry, 22 <sup>nd</sup> Ed., S. Chand and Con	npany (2016).
4.	Singl	J., Yadav L.D.S., Advanced Organic Chemistry, Pragati Edition.	
5	Morr	ison R N & Boyd R N Organic Chemistry Dorling Kindersley (India) F	Pvt Ltd (Pearson
	Educ	ation).	ver Lear (i curson
6.	Carev	y, F. A., Guiliano, R. M. Organic Chemistry, Eighth edition, McGraw Hill Educ	ation, 2012.
7.	Loud	on, G. M. Organic Chemistry, Fourth edition, Oxford University Press, 2008.	,
8	Clave	len I. Greeves N & Warren S. Organic Chemistry 2nd edition Oxford Unive	rsity Press 2012
9	Syke	s P A guidebook to Mechanism in Organic Chemistry Pearson Education 200	3
	nline I	inke•	
	https		a/
2	https	://www.you.oc.in/locturonotos/scionce/MSCCH	
2.	$\frac{11105}{17/C}$	HFMISTRV%201 N%202%20STERFOCHEMISTRV pdf	
3	https	/www.dsnmuranchi.ac.in//ndf/Blag/III%2014%20Carbon%20Carbon%2	Sigma%20Bon
5.	ds%	20hv%20Dr%20Rajeev%20Ranjan ndf	<u>JSIgina /020D011</u>
4	httns	://www.vedantu.com/chemistry/aromatic-hydrocarbons	
This (	nurse (	can be onted as an elective by the students of following subjects. Open for all	The eligibility
for thi	is paper	is 10+2 with any subject.	The englointy
Sugge	ested Co	ontinuous Evaluation Methods: • Seminar/ Presentation on any topic of the ab	ove svllabus •
Test v	vith mul	ltiple choice questions/ short and long answer questions Attendance.	ove synaous
Cours	se prere	equisites: To study this course, a student must have had the subject all in class 1	2 <sup>th</sup> . The
eligibi	ility for	this paper is $10+2$ with any subject.	-
Furth	er Sug	gestions: It widens the scope for students to join Government and Non-Government	nent organization
upskil	ling the	people at different levels as per their socio-economic structure.	
At the	- End o	f the whole syllabus any remarks/ suggestions:	



ख्वाजा मुईनुद्दीन चिश्ती भाषा विश्वविद्यालय, लखनऊ, उत्तर प्रदेश (भारत) Khwaja Moinuddin Chishti Language University, Lucknow, U.P. (India) L.P. STATE GOVERNMENT UNIVERSITY, (Recognised Under Section 2(f) & 12(B) of the UGC Act, 1956 & B.Tech. Approved by (AICTE)

Programme/	Class: Diploma	Year: Second		Semester: Thire	d		
Subject: Cher	mistry		C X 1 C				
Course Code	: B020304T	Course Title: Molecule	s of Life	Ь	D1	T	
Course Outco	omes (CO):				Bloom	n Taxonomy	
After complet	ion of course, students v	will be able to:				K1-K5	
• CO1.	Acquire knowledge abo	out different types of sug	ars and th	eir chemical			
struct	ures. Identify different t	sypes of amino acids and	determine	e the structure			
• CO2.	Explain the actions of	of enzymes in our bod	v and in	terpret enzyme		K1-K5	
inhibi	tion. Predict action of d	rugs.	5	, i i i i i i i i i i i i i i i i i i i			
• CO3.	Depict the biological in	nportance of oils and fate	S.			K2, K5	
• CO4.	Importance of lipids in	the metabolism. Differer	ntiate RNA	A and DNA and		K3, K4	
their 1	replication. Explain proc	duction of energy in our	body		<u> </u>	2	
Credits: 3	s• 60±40		Core: SE	C-3/Vocational	Cours	e-3	
Total No. of	Lectures-Tutorials-Prac	tical(in hours per week)	L-T-P: 3	-0-0		.05	
Unit		Topics				Total No.	of
		•				Lectures/	
						Hours (45)	
Ι	Carbohydrates: Suga	ars, non-sugars, reducin	ng and r	non-reducing su	igars.	10	
	Occurrence and genera	al properties of glucose	and fruct	ose. Open chair	n and		
	Haworth ring structure	es of glucose and fructo	se. Epime	ers, mutarotation	n and		
	anomers. Disaccaharide	es: Occurance of disaac	harides (S	Sucrose, Maltos	e and		
	Lactose).						
II	Nucleic Acids : Compo	onents of nucleic acids:	Adenine, g	guanine, thymin	e and	10	
	cytosine (Structure only	y), other components of	nucleic ac	cids, Nucleoside	s and		
	nucleotides (nomenclat	ture), Structure of polyr	nucleotide	s; Structure of	DNA		
	(Watson-Crick model)	and RNA (types of RN	JA), Gene	etic Code, Biolo	ogical		
	roles of DNA and RNA	A: Replication, Transcript	tion and T	ranslation.			
III	Amino Acids, Peptid	es and Proteins: α- an	nino acid	s, general for	mula,	15	
	zwitter ion form of $\alpha$ -	amino acid, general for	mula. Iso	electric point a	nd its		
	importance. Classifica	tion of amino acids as	s essentia	l and non-esse	ntial-		
	examples. Configuratio	on of optically active $\alpha$ -a	mino acid	s (found in prot	eins).		
	Peptide bond. Proteins	s: classification based 1	molecular	shape -fibrous	s and		
	globular, examples. St	tructure of protein – q	ualitative	idea about prin	mary,		
	secondary, tertiary, a	and quaternary structur	res (diag	rams not requ	ired).		
	Denaturation of protein	l.					
	Peptide bond. Proteins globular, examples. St secondary, tertiary, a Denaturation of protein	s: classification based f tructure of protein – qu and quaternary structur t.	molecular ualitative res (diagi	shape –fibrous idea about prin rams not requ	s and mary, ired).		



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IV	Oils and fats: Biological Importance of oils and fats. Fatty acids (saturated,	10
	unsaturated fatty acids, formation of triglycerides and general formula of	
	triglycerides. Chemical nature of oils and fats-saponification, acid hydrolysis,	
	rancidity and its prevention methods, refining of oils, hydrogenation of oils,	
	drying of oils. Iodine value	

Suggested Readings:

- 1. Morrison, R. T. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- 2. Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- 3. Finar, I. L. Organic Chemistry (Volume 2), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- 4. Nelson, D. L. & Cox, M. M. Lehninger's Principles of Biochemistry 7th Ed.,
- 5. W. H. Freeman. Berg, J.M., Tymoczko, J.L. & Stryer, L. Biochemistry, 2002.

#### Suggestive digital platforms web links-

- 1. http://heecontent.upsdc.gov.in/Home.aspx https://nptel.ac.in/courses/104/105/104105124/
- 2. https://nptel.ac.in/courses/103/106/105106204/ https://nptel.ac.in/courses/104/105/104105034/
- 3. https://nptel.ac.in/courses/104/103/104103121/ https://nptel.ac.in/courses/104/102/104102016/
- 4. https://nptel.ac.in/courses/104/106/104106106/ https://nptel.ac.in/courses/104/105/104105120
- 5. https://collegelearners.com/ebooks/agricultural-microbiology-pdf-free-download
- 6. https://www.shahucollegelatur.org.in/Department/Studymaterial/sci/chem/Oils%20&%20Fats.pdf

**This course can be opted as an elective by the students of following subjects:** Open for all The eligibility for this paper is 10+2 with any subject.

**Suggested Continuous Evaluation Methods:** Seminar/ Presentation on any topic of the above syllabus • Test with multiple choice questions/ short and long answer questions Attendance

**Course prerequisites:** To study this course, a student must have had the subject all in class $12^{th}$ . The eligibility for this paper is 10+2 with any subject

**Further Suggestions:** It widens the scope for students to join Government and Non-Government organization upskilling the people at different levels as per their socio-economic structure.

At the End of the whole syllabus any remarks/ suggestions:



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Programme/Class: I	Diploma	Year: Second	Semester: Fourt	h
Subject: Chemistry				
Course Code: BO20	401T	Course Title: Quantun	Mechanics and Analytical	Fechnique
Course Outcomes:			Blo	oom Taxonomy
CO1. U describe its signi orbital ti orbitals Spectrun chemistr	pon successful comp atomic structure, ele ficance; Schrodinger heory, basic ideas-Cr , Molecular Spectroso n: photo chemistry a ry plays an enormous	eletion of this course st mentary quantum mech wave equation and its iteria for forming mole copy, Rotational Spectru nd kinetics of photo che role in our society, such	udents should be able to anics ,wave function and applications; Molecular cular orbital from atomic um, vibrational Electronic mical reaction Analytical as in drug manufacturing,	K1-K6
process diagnost	control in industry, en tics, food production,	vironmental monitoring and forensic surveys.	, medical	
• CO2. It	is also of great impor	tance in different resear	ch areas.	K3, K4
CO3. A knowled or new c	nalytical chemistry is lge so that chemical a lemands.	s a science that is direct nalysis can be improved	ed towards creating new I to respond to increasing	K4, K5
• CO4. St and allie	udents will be able to d fields of science ar	explore new areas of red technology.	search in both chemistry	K2, K5
CO5. St problem	tudents will be able solving team.	to function as a membe	er of an interdisciplinary	K4, K5
CO6. S     analytics	tudents will be skil al reasoning as applie	led in problem solvin d to scientific problems.	g, critical thinking and	K3, K5
CO7. St     organic	udents will gain an ui molecules using IR a	nderstanding of how to c nd NMR spectroscopic	letermine the structure of techniques.	K2, K4
CO8. To and colu	develop basic skills imn chromatography	required for purification	, solvent extraction, TLC	K3, K5
Credits:4			Core: Compulsory	
<b>Max. Marks:</b> 25+75			Min. Passing marks: as per	rules
Total No. of Lectures	-Tutorials-Practical(i	n hours per week):L-T-I	<b>P:</b> 4-0-0	
Unit		Topics		Total No. of Lectures/
				Hours (60)



Ι	Atomic Structure: Idea of de-Broglie matter waves, Heisenberg uncertainty	5
	principle, atomic orbitals, Schrödinger wave equation, significance of $\Psi$ and $\Psi^2$ ,	
	quantum numbers, radial and angular wave functions and probability distribution	
	curves, shapes of s, p, d, orbitals. Aufbau and Pauli exclusion principles, Hund's	
	rule of maximum multiplicity.	
Ш	Elementary Quantum Mechanics : Black-body radiation, Planck's radiation	10
	law, photoelectric effect, heat capacity of solids, Bohr's model of hydrogen atom	
	(no derivation) and its defects, Compton effect. de-Broglie hypothesis.	
	Heisenberg uncertainty principle. Hamiltonian Operator. Schrödinger wave	
	equation (time dependent and time independent) and its importance, physical	
	interpretation of the wave function, postulates of quantum mechanics, particle in	
	a one dimensional box. Schrödinger wave equation for H-atom, separation into	
	three equations (without derivation), quantum numbers and their importance,	
	hydrogen like wave functions, radial wave functions, angular wave functions.	
	Molecular orbital theory, basic ideas - Criteria for forming MO from AO,	
	construction of MO by LCAO $- H_2^+$ ion, calculation of energy levels from wave	
	functions, physical picture of bonding and anti-bonding wave functions, concept	
	of $\sigma$ , $\sigma^*$ , $\pi$ , $\pi^*$ orbitals and their characteristics.	
III	Molecular Spectroscopy: Introduction: Electromagnetic radiation, regions of the	10
	spectrum, basic features of different spectrometers, statement of the Born-	
	Oppenheimer approximation, degrees of freedom.	
	Rotational Spectrum: Diatomic molecules. Energy levels of a rigid rotor (semi-	
	classical principles), selection rules, spectral intensity, distribution using	
	population distribution (Maxwell Boltzmann distribution) determination of bond	
	length, qualitative description of non-rigid rotor, isotope effect.	
	Vibrational Spectrum: Infrared spectrum: Energy levels of simple harmonic	
	oscillator selection rules nure vibrational spectrum intensity determination of	
	force constant and qualitative relation of force constant and bond energies effect	
	of anharmonic motion and isotone on the spectrum idea of vibrational frequencies	
	of different functional groups	
	or unrerent runctional groups.	



	Raman spectrum: Concept of polarizability, pure rotational and pure vibrational.	
	Raman spectra of diatomic molecules, selection rules. Electronic Spectrum:	
	Concept of potential energy curves for bonding and antibonding molecular	
	orbitals, qualitative description of selection rules.	
IV	UV-Visible Spectroscopy: Origin of spectra, interaction of radiation with matter,	5
	fundamental laws of spectroscopy and selection rules. Types of electronic	
	transitions, $\lambda$ max, chromophores and auxochromes, Bathochromic and	
	Hypsochromic shifts, Intensity of absorption; application of Woodward Rules for	
	calculation of $\lambda$ max for the conjugated dienes: alicyclic, homoannular and	
	heteroannular; extended conjugated systems distinction between cis- and trans-	
	isomers (Cis- and trans- stilbene).	
<b>V</b>	<b>Infrared Spectroscopy:</b> IR Spectroscopy: Fundamental and non-fundamental	5
	molecular vibrations: Hooke's law selection rule. IR absorption positions of	
	various functional groups (C=O, OH, NH, COOH and nitrile). Effect of H-	
	bonding conjugation resonance and ring size of cyclic ketones and lactones on	
	IP absorptions: Eingerprint region and its significance: application in functional	
	in absorptions, fingerprint region and its significance, application in functional	
	group analysis and interpretation of 1.R. spectra of simple organic compounds.	
	Identification of the Carbonyl group in Ketones, Aldenydes, Carboxylic acids,	
	Esters and Amides using IR Spectroscopy.	
VI	<sup>1</sup> H-NMR Spectroscopy (PMR):	10
	NMR Spectroscopy: introduction; nuclear spin; NMR active molecules; basic	
	principles of Proton Magnetic Resonance; choice of solvent and internal standard;	
	equivalent and non-equivalent protons; chemical shift and factors influencing it;	
	ring current effect: significance of the terms: up-/downfield, shielded and	
	deshielded protons: spin coupling and coupling constant (1 <sup>st</sup> order spectra):	
	relative intensities of first-order multiplets: Pascal's triangle: chemical and	
	magnetic equivalence in NMR: anisotronic effects in alkene, alkyne, aldehydes	
	and aromatics: NMR peak area, integration: relative peak positions with coupling	
	natterns of common organic compounds: interpretation of NMR spectra of simple	
	compounds. Applications of IR LIV and NMP spectroscopy for identification of	
	simple organic molecules such as Ethenel. Ethyl sectors,	
1	simple organic molecules such as Ethanol, Ethyl acetate, acetone, acetaldenyde,	



	dimethylformamide, Cis and trans 1, 2 - dimethyl cycloprpanone, propene, vinyl	
	chloride, acetophenone, benzaldehyde, phenol, Toluene and ethyl benzene.	
VII	Introduction to Mass Spectrometry: Principle of mass spectrometry, the mass	3
	spectrum, mass spectrometry diagram, molecular ion, metastable ion,	
	fragmentation process, McLafferty rearrangement	
VIII	Separation Techniques: Solvent extraction: Classification, principle and	7
	efficiency of the technique. Mechanism of extraction: extraction by solvation and	
	chelation. Technique of extraction: batch, continuous and counter current	
	extractions. Qualitative and quantitative aspects of solvent extraction: extraction	
	of metal ions from aqueous solution, extraction of organic species from the	
	aqueous and non- aqueous media. Chromatography: Classification, principle and	
	efficiency of the technique. Mechanism of separation: adsorption, partition & ion	
	exchange. Development of chromatograms: frontal, elution and displacement	
	methods.	
Suggested Reading	is:	
• 1. <i>A</i>	Alberty, R A, Physical Chemistry, 4th edition Wiley Eastern Ltd, 2001.	
• 2. A	Atkins, PW, the elements of physical chemistry, Oxford, 1991.	
• 3. E	Barrow, G.M, International student Edition. McGraw Hill, McGraw-Hill, 1973.	
• 4.0	Cotton, F.A, Wilkinson, G and Gaus, P. L, Basic Inorganic Chemistry, 3rd Edition, Wil	ley 1995
• 5. I	Lee, J.D, Concise Inorganic Chemistry 4th Edition ELBS,1977	
• 6.0	Clayden, J., Greeves, N., Warren, S., Organic Chemistry, Second edition, Oxford Univ	versity Press 2012.
• 7. S	Silverstein, R. M., Bassler, G. C., Morrill, T. C. Spectrometric Identification of Organi	c Compounds,
Joh	n Wiley and Sons, INC, Fifth edition.	
• 8. Pavia, D. L. <i>et al.</i> Introduction to Spectroscopy, 5 <sup>th</sup> <i>Ed.</i> Cengage Learning India Ed.		
• 9. V	Willard, H.H. et al.: Instrumental Methods of Analysis, 7th Ed. Wardsworth Publishing	g Company,
Bel	mont, California, USA, 1988.	
• 10.	Christian, G.D. Analytical Chemistry, 6th Ed. John Wiley & Sons, New York, 2004.	
• 11. Harris, D.C.: Exploring Chemical Analysis, 9th Ed. New York, W.H. Freeman, 2016.		
• 12.	Khopkar, S.M. Basic Concepts of Analytical Chemistry. New Age International Public	isher, 2009.

13. Mukherji, Singh, Kapoor, Organic Chemistry, Vol 1 and 2. New Age International 2014 ٠



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- 15. RL Madan, CHEMSITRY FOR DEGREE STUDENTS ELECTIVE SEM V/VI AS PER CBS QUANTUM AND SPECTROSCOPY, S Chand Publishing
- 16. Y.R. Sharma, ELEMENTARY ORGANIC SPECTROSCOPY VOL 4, S Chand
- 17. GURDEEP RAJ, ADVANCED PHYSICAL CHEMSITRY, KRISHNA PUBLISHING
- 18. K.L.Kapoor, A Textbook of Physical Chemistry Quantum Chemistry and Molecular Spectroscopy | Volume 4, Macmillan
- 19. TN SRIVASTVA AND PC KAMPOJ, SYSTEMATIC NALYTICAL CHEMISTRY, SHOBAN LAL NAGIN CHAND

Suggestive digital platforms web links

- 1. https://www.coursera.org/courses?query=chemistry&languages=en
- 2. https://www.mooc-list.com/tags/physical-chemistry
- 3. https://www.coursera.org/learn/physical-chemistry
- 4. https://ocw.mit.edu/courses/chemistry/5-61-physical-chemistry-fall-2017/
- 5. http://heecontent.upsdc.gov.in/Home.aspx
- 6. https://nptel.ac.in/courses/104/108/104108078/
- 7. https://nptel.ac.in/courses/104/108/104108124/
- 8. https://nptel.ac.in/courses/104/106/104106122

This course can be opted as an elective by the students of following subjects: Open for all

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**Course prerequisites:** To study this course, a student must have had the subject "Chemistry" in III Semester of Diploma course Chemistry

Suggested Continuous Evaluation MethodsHouse Examination/Test:10 marks

Written Assignment/Presentation/Project/Research Orientation/Term papers/Seminar: 10 marks

Class performance/Participate: 5Marks

Further Suggestions: None



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Programme/ Class: Dip	oloma	Year: Second	Semester: Fourth	
Subject: Chemistry				
Course Code: B020402	Р	Course Title: Instrum	nental Analysis	
Course Outcomes:				Bloom Taxonomy
• CO1. Upon co thinking and	mpletion of this cou scientific inquiry i	rse, chemistry majors n the performance,	are able to employ critical design, interpretation and	K2, K3
documentation position in chen	of laboratory experim nical industry or a che	ents, at a level suitable mistry graduate prograf	e to succeed at an entry-level m.	
• CO2. Students	will be able to explore	e new areas of research	in both chemistry and allied	K4, K5
fields of science interdisciplinary	e and technology. · S / problem solving tear	tudents will be able to n.	function as a member of an	
CO3. Students v     as applied to sci	will be skilled in proble entific problems.	em solving, critical thin	king and analytical reasoning	K2, K4
CO4. Students molecules using	will gain an understan g IR and NMR spectro	ding of how to determin scopic techniques.	ne the structure of organic	K3, K5
CO5. To develo chromatography	p basic skills required	for purification, solven	t extraction, TLC and column	K4, K5
Credits: 2			Core: Compulsory	1
Max. Marks: 25+75Min. Passing marks: as per rule		les		
Total No. of Lectures-7	Futorials-Practical (in	hours per week): L-T-P	:0-0-2	
S. No.	Objectives		Total No. of	
				Lectures/ Hours (60)
1	Molecular Weight 1. Determination of	<b>Determination</b> f molecular weight of a	a non-volatile solute by Rast me	ethod/
	Beckmann freezing	point method.		
	2. Determination of	he apparent degree of d	issociation of an electrolyte (e.g., l	NaCl)



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	in aqueous solution at different concentrations by ebullioscopy.		
2	Spectrophotometry	20	
	1. To verify Beer – Lambert Law for $KMnO_4/K_2Cr_2O_7$ and determining the		
	concentration of the given solution of the substance from absorption measurement		
	2. Determination of $p$ Ka values of indicator using spectrophotometry.		
	3. Determination of chemical oxygen demand (COD).		
	4. Determination of Biological oxygen demand (BOD).		
3	Spectroscopy	10	
	1. Assignment of labelled peaks in the IR spectrum of the same compound		
	explaining the relative frequencies of the absorptions (C-H, O-H, N-H, C-O, C-N,		
	C-X, C=C, C=O, N=O, C=C, C=N stretching frequencies; characteristic bending		
	vibrations are included. Spectra to be provided).		
	2. Assignment of labelled peaks in the 1H NMR spectra of the known organic		
	compounds explaining the relative $\delta$ -values and splitting pattern. 3. Identification		
	of simple organic compounds by IR spectroscopy and NMR spectroscopy (Spectra		
	to be provided).		
4	Chromatographic Separations:	20	
	1. Paper chromatographic separation of following metal ions: i. Ni(II) and		
	Co(II) ii. Cu(II) and Cd(II).		
	2. Separation of a mixture of <i>o</i> -and <i>p</i> -nitrophenol or <i>o</i> -and <i>p</i> -aminophenol		
	by thin layer Chromatography (TLC).		
	3. Separation and identification of the amino acids present in the given		
	mixture by paper chromatography. Reporting the Rf values.		
	4. TLC separation of a mixture of dyes (fluorescein and methylene blue).		
Suggested readings:	in a line line line line line line line chemical Analasia che e la presente	2000	
2. Willard, H.H. <i>et</i>	ings: 1. Mendnam, J., A. I. Vogel's Quantitative Chemical Analysis $6^{th} Ea$ ., Pearson, $fal$ .: Instrumental Methods of Analysis, $7^{th} Ed$ . Wardsworth Publishing Company, Be	2009. Elmont,	
California, USA, 1988. 3 Christian G.D. Analytical Chemistry 6 <sup>th</sup> Ed. John Wiley & Song New York 2004			
<ol> <li>4. Harris, D.C. Exploring Chemical Analysis, 9<sup>th</sup> Ed. New York, W.H. Freeman, 2016.</li> </ol>			
5. Khopkar, S.M.	5. Khopkar, S.M. Basic Concepts of Analytical Chemistry. New Age International Publisher, 2009.		
6. Skoog, D.A. Holler F.J. and Nieman, T.A. Principles of Instrumental Analysis, Cengage Learning India Edition. 7 Mikes O & Chalmes B A Laboratory Handbook of Chromatographic & Allied Methods Elles Harwood Ltd			
London.			

8. Ditts, R.V. Analytical Chemistry: Methods of separation. Van Nostrand, New York, 1974



Digital links:

• 1. https://www.labster.com/chemistry-virtual-labs/

• 2. https://www.vlab.co.in/broad-area-chemical-sciences 3. http://chemcollective.org/vlab

This course can be opted as an elective by the students of following subjects: Open for all

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**Course prerequisites:** To study this course, a student must have had the subject "Chemistry" in III Semester of Diploma course in chemistry.

Suggested Continuous Evaluation Methods

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Further Suggestions: None



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Programme/Class: Diploma		Year: Second Semester: Fourth			
Subject: Chemistry					
Course Code: I	3020404T	Course Title: Introdu	ction of Che	emistry in Everyday	Life
Course Outcomes (CO): Bl				Bloom Taxonomy	
CO1 T	.1 . 1	· ·	6.01	· . 1 ·	
• COL I	o expose the students to the their prevalent in the	various emerging new a	their appli	cations in various	K2-K0
spheres of chemical sciences					
• CO2. T	o enhance student sense	of enthusiasm for che	mistry and	to involve them in	K3, K5
an intel	lectually stimulating exp	perience of learning in	a supportiv	e environment.	
• CO3. T	o enhance practical know	wledge			K3, K4
• CO4. T	o motivate self-employr	nent ability			K2, K4
• CO5. T	o create self-efficiency.		-		K4, K5
Credits: 3 Core: SEC-4/Vocational Cour			rse-4		
Max. Marks: 60+40 Min. Passing marks: as per r			ules		
Total No. of Le	Total No. of Lectures-Tutorials-Practical(in hours per week): L-T-P: 3-0-0				
Unit		Topics			Total No. of
					Lectures/
I	Housebold chemicals	• History of househ	old Industr	w Basic Theory	10 Hours (45)
1	Household chemicals. This of y of household industry, basic theory of				
	Household Chemicals, and Raw material required for household product,			ι,	
	Product manufacture in household industry. Role of household product in day-			-	
	to-day life.				
П	Cleaning agents: Introduction, synthesis and applications of Natural cleaning			g <b>8</b>	
	agents, cleaning action, Floor cleaner, Toilet Cleaner, Bathroom Cleaner,			.,	
	Kitchen Cleaner.				
III	<b>Technology of Soap:</b> Chemistry of soap; Raw material for soap industry and			d 12	
	their selection; hard fats yielding and oil yielding soaps; Chemical reactions of			of	
	soaps; Hard and Soft soaps; Plant and process employed in soap manufacture:				:
	Liquid hand wash and liquid dish wash				
	Detergents and surface	tents: Introduction: D	ifforant torr	ne used in detergent	c. 15
T A	Dere gents and sullat				o, <b>10</b>
	Raw materials for detergents; wasning action of detergents; Types of				Π
	detergents; Introduction	n of surfactants; Types	of surfactar	nts.	



ख्वाजा मुईनुद्दीन चिश्ती भाषा विश्वविद्यालय, लखनऊ, उत्तर प्रदेश (भारत)

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#### Suggested Readings:

- 1. Small scale industries and house hold industries in developing economy by Shetty M.C.
- 2. Manufacture of perfume cosmetics and detergents by Prasad Giri Raj
- 3. Industrial chemistry by B.K. Sharma
- 4. flavours & Essential oils, Industries SBP Board
- 5. Perfumes soaps & cosmetics by Poucher.
- 6. Manufacture of perfumes, cosmetics and detergents by Giriraj Prasad
- 7. Manufacture of perfumes, cosmetics and detergents by Prasad.

#### **Online Links:**

- 1. https://en.wikipedia.org/wiki/Household\_chemicals
- 2. https://hmhub.in/cleaning-agents/
- 3. <u>https://www.aocs.org/stay-informed/aocs-continuing-education-program/soap-fundamentals?SSO=True</u>
- 4. https://naldc.nal.usda.gov/download/CAT87201929/PDF

**This course can be opted as an elective by the students of following subjects:** Open for all The eligibility for this paper is 10+2 with any subject.

**Suggested Continuous Evaluation Methods:** Seminar/ Presentation on any topic of the above syllabus • Test with multiple choice questions/ short and long answer questions Attendance

**Course prerequisites:** To study this course, a student must have had the subject all in class $12^{\text{th}}$ . The eligibility for this paper is 10+2 with any subject

**Further Suggestions:** It widens the scope for students to join Government and Non-Government organization upskilling the people at different levels as per their socio-economic structure.

At the End of the whole syllabus any remarks/ suggestions: