KUNTHAVAI NAACCHIYAAR GOVT. ARTS COLLEGE FOR WOMEN (AUTONOMOUS)

Thanjavur – 613 007, Tamil Nadu, India.
Re-Accredited by NAAC with 'B' Grade
Affiliated to Bharathidasan University

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CBCS & OBE
Scheme of Instruction and Syllabus for M.Sc., Chemistry

(I to IV Semester)
Effective from 2022-2023 Onwards

DEPARTMENT OF CHEMISTRY

KUNTHAVAI NAACCHIYAAR GOVT. ARTS COLLEGE FOR WOMEN (AUTONOMOUS)

DEPARTMENT OF CHEMISTRY

I. VISION

1. To impart higher education to women.
2. To transform and empower the women students through education by enhancing the qualities of competence, confidence and excellence.

II. MISSION

1. To educate the students from the rural area qualitatively.
2. To create social awareness.
3. To enable rational thinking and social responsibility.
4. To empower the students to face the challenges and hurdles in their upcoming life.

III. PROGRAM OUTCOME (PO)

After successful completion of the two year degree program, a student should be able to

PO 1 : Indulge in deeper learning of the principle of organic,inorganic and physical chemistry.

PO 2 : Master factual and experimental knowledge across the principal areas of chemistry.

PO 3 : Acquires the ability to synthesis,separate and characterise the compounds using laboratory and instrumentation techniques.

PO 4 : Demonstrate, solve and understanding of major concepts in all disciplines of chemistry.

PO 5 : Learn Research methodology,analytical , spectroscopic tools and applications of various disciplines of chemistry.

PO 6 :Understand the role of chemistry in everyday life.

PO 7 : Develop critical thinking,analytical reasoning skill and Research skill.

PO 8 : Think rationally,systematically, independently to analyze the chemical problems and to draw a logical conclusion.

PO 9 : Ability to implement chemistry in an integral activity of social,economical and environmental problems.

PO10: Attain employability,entrepreneurial skills to find out the jobs and start the own industry respectively.

IV.Programme Structure

M.Sc Chemistry Course CBSE Structure with OBE (for the candidates admitted 2022-23)

Sem	Course	Existing Code	Title of the Paper	Inst. Hrs.	Credit	Exam Hrs.	Marks		Total
							Int.	Ext.	
I	CC1	22KP1CH01	Inorganic Chemistry - I	6	5	3	25	75	100
	CC 2	22KP1CH02	Organic Chemistry -I	6	5	3	25	75	100
	CC 3(P)	22KP1CH03P	Inorganic Chemistry Practical–I	6	4	6	40	60	100
	CC 4(P)	22KP1CH04P	Organic Chemistry Practical– I	6	5	6	40	60	100
	MBE 1	22KP1CHELCH1:1	Instrumental Methods of Chemical Analysis	6	4	3	25	75	100
		22KP1CHELCH1:2	Molecular Modeling and Drug Design						
	Total			**30**	**23**		**155**	**345**	**500**
II	CC 5	22KP2CH05	Organic Chemistry - II	7	5	3	25	75	100
	CC 6	22KP2CH06	Physical Chemistry - I	7	5	3	25	75	100
	CC 7 (P)	22KP2CH07P	Inorganic Chemistry Practical-II	6	4	6	40	60	100
	CC 8(P)	22KP2CH08P	Organic Chemistry Practical-II	6	5	6	40	60	100
	NME 1	22KP2CHELO1	Health Chemistry	4	3	3	25	75	100
	ECC1	22KP2ECCCH1:1	Chemistry in Everyday Life (Value added Course)	-	3	3	-	100	100
		22KP2ECCCH1:2	MOOC (Value added Course)						
	ECC2	22KP2ECCCH2	Textile Chemistry (Add on Course)		4				
	Total			**30**	**22**		**155**	**345**	**500**
III	CC 9	22KP3CH09	Organic Chemistry – III	7	5	3	25	75	100
	CC 10	22KP3CH10	Spectroscopic Methods	7	5	3	25	75	100
	CC 11(P)	22KP3CH11P	Physical Chemistry Practical-I	6	5	6	40	60	100
	MBE 2	22KP3CHELCH2:1	Research Methodology and Recent trends in chemistry	6	4	3	25	75	100
		22KP3CHELCH2:2	Electro Analytical chemistry						
	NME 2	22KP3CHELO2	Pollution and its control measures	4	3	3	25	75	100
	ECC 3	22KP3ECCCH3:1	Chemistry of Nano Science &Nano Technology (Value added Course)	-	3	3	-	-	100
		22KP3ECCCH3:2	MOOC (Value added Course)						
	Total			**30**	**22**		**140**	**360**	**500**

IV	CC 12	22KP4CH12	Inorganic Chemistry - II	6	5	3	25	75	100
	CC 13	22KP4CH13	Physical Chemistry - II	6	4	3	25	75	100
	CC14(P)	22KP4CH14P	Physical Chemistry Practical – II	6	4	6	40	60	100
	MBE 3	22KP4CHELCH3: 1	Polymer Chemistry	6	4	3	25	75	100
		22KP4CHELCH3: 2	Chemistry of Biomolecules						
		22KP4CH15PW	Project	6	6	-	-	100	100
	Total			**30**	**23**		**115**	**385**	**500**
	Grand Total			**120**	**90**		**565**	**1435**	**2000**

Semester	Courses	Total Papers	Ins.Hrs/Week	Credit
I	CC1,CC2,CC3(P), CC4(P), MBE1	5	30	23
II	CC5,CC6,CC7(P), CC8(P), NME 1	5	30	22
III	CC9,CC10,CC11(P), MBE 2,NME 2	5	30	22
IV	CC12,CC13,CC14(P), MBE 3, Project	5	30	23
	Total	**20**	**120**	**90**

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Non Major Elective – Semester II

S.No.	Course Title	Code	Department
1	கவின்கலைகள்	22KP2TELO1	Tamil
2	English Grammar and Usage – I	22KP2EELO1	English
3	Indian Archaeology	22KP2HELO1	History
4	Agricultural Economics	22KP2ECELO1	Economics
5	Numerical Methods and Operations Research	22KP2MELO1	Mathematics
6	Astro Physics	22KP2PELO1	Physics
7	Health Chemistry	22KP2CHELO1	Chemistry
8	Herbal Technology	22KP2BELO1	Botany
9	Apiculture	22KP2ZELO1	Zoology
10	Environmental Geography	22KP2GELO1	Geography
11	Vital Statistics	22KP2SELO1	Statistics
12	Network Communication	22KP2CSELO1	Computer Science
13	Consumer Rights and Education	22KP2COELO1	Commerce

Non Major Elective – Semester III

S.No.	Course Title	Code	Department
1	ஊடகம் சார் படைப்பாக்கம்	22KP3TELO2	Tamil
2	English Grammar and Usage – II	22KP3EELO2	English
3	Women Studies	22KP3HELO2	History
4	Economics for Competitive Examinations	22KP3ECELO2	Economics
5	Optimization Techniques	22KP3MELO2	Mathematics
6	Ultrasonics	22KP3PELO2	Physics
7	Pollution and its control measures	22KP3CHELO2	Chemistry
8	Mushroom Cultivation	22KP3BELO2	Botany
9	Public Health of Hygiene	22KP3ZELO2	Zoology
10	Geography of Tourism	22KP3GELO2	Geography
11	Survival Analysis	22KP3SELO2	Statistics
12	Desktop Publishing	22KP3CSELO2	Computer Science
13	E-Commerce	22KP3COELO2	Commerce

SEM I	CC1	INORGANIC CHEMISTRY – I	22KP1CH01	Inst.Hrs.6	Credit:5

CO	STATEMENT	
	After successful completion of the course, the students will be able to	
1	Appreciate the concept of Acid-base theory, ionic bonding and radius ratio rules.	K5
2	Comprehend and the stability of complexes, CFT, CFSE and spectrochemical series.	K2
3	Acquire the Knowledge in octahedral ligand substitution reaction, trans effect and redox reaction.	K1
4	Explain the various types of nuclear reaction and know the NQR spectroscopy.	K5
5	Compare the metal clusters , types of polyanions and boranes.	K4
K1-Remember; **K2**-Understand;**K3**-Apply; **K4**-Analyse; **K5**-Evaluate **K6**-Create		

UNIT-I

1. Acid- Base and Ionic bonds

1.1 Usanowich concept –-steric and solvation effects– measure of acid-base strength- HSAB principle- classification of acids and bases as hard and soft- acid base strength- hardness and softness- E and C parameters- symbiosis- theoretical basis of hardness and softness.

1.2 Ionic bonding- Lattice energy – derivation of Bornlande equation- Kapustinski equation- high Tc super conductors- Solid state reactions.

1.3 Radius ratio rules- calculation of some limiting radius ratio values for CN. 3 (planar triangle) CN. 4 (tetrahedral) and CN.6 (Octahedral)
Ionic structures –Fluorite , Rutile, Zinc sulphide.

UNIT-II

2. Co-ordination Chemistry

2.1 Stability of complexes- factors affecting stability of complexes, thermodynamic aspects of complex formation, stepwise and overall formation constants, stability correlation, statistical and chelate effects, determination of stability constant- polarographic, photometric and potentiometric methods.

2.2 Crystal field theory- splitting of d-orbitals under various geometries- factors affecting the magnitude of splitting- CFSE and its evidences (structural and thermodynamic effects)

2.3 Spectrochemical series- Jorgensen relation, Jahn- Teller distortion- spectral and magnetic properties of complexes- site preferences, limitations of CFT, Nephelauxetic effects- the angular overlap model.

UNIT-III

3. Reaction Mechanisms of Transition Metal Complexes

3.1 Inert and labile complexes- kinetics of octahedral substitution- acid hydrolysis- base hydrolysis and its mechanism (S_N1, S_N2& S_N1_{CB})Complementary and non complementary reactions - direct and indirect evidences in favour of conjugate mechanism.

3.2 Substitution reactions in square planar complexes- the trans effect- mechanism of substitution reaction.

3.3 Redox reactions- electron transfer reactions- mechanism of one electron transfer reactions- outer sphere type reactions-cross reactions and inner sphere type reactions.

UNIT – IV

4. Nuclear Chemistry

Properties of Nuclei- Nuclear forces- Structure of Nucleus- Radioactive decay- Law of radioactive decay-Nuclear reactions- Scattering, Transmutation, Stripping and pickup, spallation fragmentation reaction, nuclear cross section, Q-value, threshold energy, nuclear reactions, nuclear fission and fusion reactions as energy sources, Nuclear reactors – neutron activation and isotope dilution analysis, Applications of nuclear science.

UNIT – V

5. Metal Clusters & Inorganic Polymers

5.1 Metal clusters- compounds with metal–metal multiple bonds- bonding in metal clusters- Wade Model- Luhar Model, Capping rule, carbide cluster- clusters having interstitial main group elements. Applications of organo metals C-C and C-N cross coupling reaction.

5.2 Isopoly anions – basic building units of Vanadates, Molybdates, Tungstates ions- Heteropoly anions- structure only.

5.3 Higher boranes- carboranes- metalboranes- metalloboranes – metallocarboranes.

References

1. G.Friendlender, J.W.Kennedy and J.M.Miller, *Nuclear and radiochemistry* (unit IV)
2. E.Huheey,Inorganic chemistry: *Principles of structure and* reactivity.
3. F.A.Cotton and G.Wilkinson, *Advanced Inorganic chemistry*.
4. Sisler, *Chemistry in Non-aqueous solvents*.
5. J.D.Lee – fourth edition, *Precise Inorganic chemistry*.
6. K.C.Day and J.Selbin, *Theoritical Inorganic chemistry*.
7. T.Moeller, *Inorganic chemistry*.
8. D.F.Shriven and P.W.Atkins, *Inorganic Chemistry*,Oxford.

CO – PO Mapping :

Inorganic Chemistry–I **Code: 22KP1CH01**

CO	PO									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	3	3	1	2	1	2	3	3	2	1
2	3	3	1	3	1	2	3	3	2	1
3	3	3	1	1	1	3	3	3	2	1
4	3	3	2	2	2	3	3	3	3	3
5	3	3	1	2	1	3	3	3	2	2

1 – Low, 2 – Moderate, 3 – High correlation

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SEM I	CC 2	ORGANIC CHEMISTRY-I	22KP1CH02	Inst.Hrs.6	Credit:5

CO	STATEMENT	
	After successful completion of the course, the students will be able to	
1	Identify the IUPAC name of stereo and regio specific compounds reaction intermediate and kinectic aspects	K4
2	Learn the concept of aromaticity and its Structure	K1
3	Assign RS, DL and EZ rotation, and analyse stereo isomerism and optical relationship in organic molecules.	K3
4	Provide the comprehensive information about the stereo chemistry of organic molecules.	K5
5	Understand the synthesis and applications of hetero cyclic compounds.	K2
K1-Remember;**K2**-Understand;**K3**-Apply; **K4**-Analyse; **K5**-Evaluate **K6**-Create		

UNIT-I

1. Nomenclature, Reaction Intermediates and Thermodynamic and Kinetic Aspects of Organic Reactions

1.1 Nomenclature of Organic Compounds

IUPAC nomenclature of organic molecules of Regio and Stereo isomers.

1.2. Reaction Intermediates.

Free radicals, carbenes, nitrenes, carbanions, carbocations– generation, stability, structure
and reactivity- non-classical carbocations.

1.3. Thermodynamic and Kinetic Aspects of Organic Reactions

Energy profiles diagrams – intermediate versus Transition State – Isotope effects. Non kinetic methods – product analysis and its importance. Trapping, testing and detection of intermediates. Evidence from reaction catalysis, cross over experiments, isotope labeling and stereo chemical studies. correlation analysis – Hammandposulates, Linear Free Energy relationships- Hammet, Taft equations. Significance of σ and ρ - applications**.**

UNIT- II

2.**Aromaticity and Optical Rotatory Dispersion (ORD) and Circular Dichroism(CD)**

2.1 **Aromaticity**

Concept of aromaticity- Huckel's and Craig's rule- Effect of aromaticity on bond

lengths- Ring Current- aromatic character in benzene-5,6,7 and 8 membered rings- heterocyclic systems- (18)annulenes,(14) annulenes, cyclic propeniumCation,
Syndones and fullerenes.

2.2 Optical Rotatory Dispersion (ORD) and Circular Dichroism (CD).
Definition, Cotton effect, deduction of Absolute Configuration- Axial HaloKetone Rule- Octant Rule of Ketones.

UNIT – III

3. Stereochemistry I

3.1 Principles of Symmetry – Stereo isomerism –Optical isomerism – definitions – conventions used in Stereo chemistry – Perspective formula (wedge formula) Newman, Sawhorse and Fischer notations, inter conversions and representations.

3.2 Optical activity and Chirality, types of molecules exhibiting optical activity- creation of chiral centre at carbonyl group, configuration – D&L notation, R & S notation. Molecules with more than one chiral centre- molecular chirality- Atropisomerism – StereoChemistry of Biphenyls, Allenes and Spirans. Configurations in mono and bicyclic ring systems.E & Z isomers.

UNIT – IV

4. Stereochemistry II

4.1 Methods of determining configuration- Absolute and Relative configuration. Racemic modification- properties and resolution of Racemic compounds. Walden inversion – Asymmetric synthesis based on Cram's Rule- Prolong rule. Determination of Configuration of Geometrical isomers.Enantiotropic behaviour and Prochiralcentres.

4.2 Stereochemistry of Overcrowded molecules – Ansa Compounds, Cyclophanes And Hexahelicane.

4.3 Conformations of cyclic and bicyclic ring systems – cis and trans, Nomenclature of substituted Cyclohexanes, Conformation of Cyclohexane, mono and disubstitutedCyclohexanes, Decalins.

UNIT – V

5. Heterocyclic Compounds

Synthesis and reactions of Azoles- Pyrazole, Imidazole, Oxazole,thiazole, Osotriazoles and Triazoles- Synthesisand reactions of azepine, pyridazine, pyrimidine, pyrazine, Anthocyanins and Flavone, Diazines containing one Nitrogen atom and an oxgygen orsulphur atom – Oxazines, thiazine and Phenoxazine.

References

1. R.Panico, W.H.Powell, L.Jean, C.Richer, *A guide of IUPAC* nomenclature of organiccompounds. (1993)
2. R.S.Cahn and O.C.Dermer, Introduction to chemical Nomenclature 5thedn. Butterworths. 1979.
3. M.Harris, Fundamentals of Organic reactions mechanisms, John-wiley.
4. R.K.Bansal, *Organic reactions mechanisms*, Tata McGraw Hill,1962.
5. I.L.Finar, *Organic Chemistry Vol-II*, 5thedn. ELBS 1975.
6. Jerry march, *Advanced Organic Chemistry – Reaction Mechanism and Structure*, 4thedn., Wiley 1999.
7. F.A.Carey and R.J.Sundburg, *Advanced Organic Chemistry*, *Parts A and B*, Plenum, 3rdedn., 1984 vol I & II.
8. H.O.House, Benjamin, *Modern Organic Reactions*.
9. Peter Sykes, Longman, *A Guide Book to Mechanism in Organic Chemistry*.
10. Hetero cyclic Chemistry Acheson

CO – PO Mapping :

Organic Chemistry –I **Code: 22KP1CH02**

CO	PO									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	3	3	1	3	3	1	3	3	1	3
2	3	3	3	3	3	2	2	3	1	3
3	3	1	3	3	3	3	3	3	1	2
4	3	2	1	3	1	1	3	3	2	3
5	3	3	3	3	3	2	3	3	2	3

1 – Low, 2 – Moderate, 3 – High correlation

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SEM I	CC3(P)	INORGANIC CHEMISTRY PRACTICAL – I	22KP1CH03P	Ins.Hrs.6	Credit:4

CO	STATEMENT	
	After successful completion of the course, the students will be able to	
1	Categorize most common and less common ion by using semi-micro inorganic qualitative methods.	K6
2	Analyse the volumetric and quantitative estimations of mixtures of cations,	K4
3	Adapt and formulate suitable methods for the preparation of desire inorganic complexes.	K3
4	Learn the colorimetric analysis and estimation of some common metals,	K1
5	Understand the Beer-Lambert's law.	K2
K1-Remember; **K2**-Understand;**K3**-Apply; **K4**-Analyse; **K5**-Evaluate **K6**-Create		

1. Semi micro qualitative analysis of a mixture containing two common cations and two ions containing the following less familiar elements- Ti, W, Se, Tl, Mo, Ce, Th, Zr, V, Be, U, Li etc.
2. Colorimetric Estimation of Copper, Ferric, Nickel, Chromium and Manganese using photoelectric colorimeter.

References

1. Inorganic semi-micro quantitative analysis. V.V,Ramasamy. The National publishing house , Chennai., 1990.
2. Experimental inorganic chemistry, W.G. Palmer, Cambridge university press, Cambridge, 1965.
3. A.I. Vogel, Text book of quantitative inorganic analysis, V Edition, Longman , 1989

CO – PO Mapping :

Inorganic Chemistry Practical - I **Code : 22KP1CH03P**

CO	PO									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	3	3	2	3	3	2	3	3	1	2
2	3	3	2	3	3	2	3	3	1	2
3	2	3	3	3	3	1	2	3	1	2
4	3	3	2	3	3	2	3	3	3	2
5	3	2	2	2	2	2	3	3	3	3

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SEM I	CC4(P)	ORGANIC CHEMISTRY PRACTICAL-I	22KP1CH04P	Inst.Hr:6	Credit:5

CO	STATEMENT	
	After successful completion of the course, the students will be able to	
1	Separate the organic mixtures and identify the various functional groups through analysis.	K6
2	Demonstrate various reactions practically to prepare the organic compounds.	K3
3	Synthesis the organic compound by single stage.	K6
4	Imbibing the professional ethics in the synthesis of new compound.	K2
5	Separate the amino acids using paper chromatography	K4
K1-Remember; **K2**-Understand;**K3**-Apply; **K4**-Analyse; **K5**-Evaluate **K6**-Create		

1. Qualitative analysis of an Organic mixture containing two components. Pilot separation, bulk separation, analysis and derivatization.

2. Preparation of organic compound (single stage)
   a) Methyl-m-nitrobenzoate from methyl benzoate (nitration)
   b) Glucose pentaacetate from glucose (acetylation)
   c) Benzophenoneoxime from benzophenone (addition)
   d) O-chlorobenzoic acid from anthranilic acid (Sandmeyer Reaction)
   e) Phenylazo-2-naphthol from aniline (diazotisation)
   f)
3. Paper Chromatography- separation of amino acids (anthranilic acid and n-methyl anthranilic acid) and carbohydrates (glucose and fructose)

References

1. A.I. Vogel, Text book of practical organic analysis, V Edition, ELBS , London, 1989.

CO – PO Mapping :

Organic Chemistry Practical-I **Code : 22KP1CH04P**

CO	PO									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	3	3	3	3	3	1	3	3	1	1
2	2	3	3	3	3	1	3	3	1	2
3	3	3	3	3	3	2	3	3	1	2
4	3	3	3	3	3	2	3	3	2	3
5	2	3	3	3	3	2	2	3	1	2

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SEM I	MBE 1:1	INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS	22KP1CHELCH1:1	Ins.Hrs.6	Credit:4

CO	STATEMENT	
	After successful completion of the course, the students will be able to	
1	Understand the sample method and evalued the verification strategy in the Error analysis.	K2
2	Expertise in the instrumentation, detection and quantitative analysis by chromatographic techniques	K6
3	Acquire intense knowledge instrumentation and applications	K3
4	Learn the principle, analysis and application	K2
5	Understand the thermal methods of analysis, thermometric titrations, theory and instrumentation of electro analytical techniques.	K2
K1-Remember; **K2**-Understand;**K3**-Apply; **K4**-Analyse; **K5**-Evaluate **K6**-Create		

UNIT – I

1. Introduction

1.1 Classification of quantitative methods of analysis, Sampling – Preparing a laboratory sample, Mixing solid laboratory sample – separation – precipitation and solvent extraction – extraction techniques.

1.2 Error Analysis- Types of errors – significant figures – Precision and Accuracy – Confidence Limits – Comparison of data – T- test, $\chi 2$-test.

UNIT – II

2. Chromatographic Methods -I

2.1 Paper Chromatography-descending chromatography, ascending chromatography-Ascending – Descending chromatography, Radial Paper chromatography, Two-dimensional chromatography, Zone electrophoresis.

2.2 Thin Layer Chromatography – Coating materials, preparation of thin layers in plates – development of the chromatogram, evaluation.

2.3 Column chromatography – Adsorbent – Adsorbate – preparation of column, solvents used, detectors, methods of introducing the solution, analysis.

UNIT – III

3. Chromatographic Methods -II

3.1 Gas chromatography – Basic components of gas chromatographs-instruments– carrier gas – sample introduction system, columns, temperature – control system. Evaluation – retention volume, resolution, applications of gas chromatography.

3.2 High performance liquid chromatography – instruments, high performance

partition chromatography, high performance size exclusion chromatography – supercritical – fluid chromatography and applications.

UNIT – IV

4 Polarography

Polarography Principles – and introduction, instruments current voltage – relationship polarogramspolarograpic waves – equation- half wave potential- reversible and irreversible waves – residual current –migration current – diffusion current – polarographic cells – dropping mercury electrode – advantages of DME – agar salt bridge –saturated calomel electrode – applications of polarography qualitative and quantitive analysis – inorganic and organic polarographic analysis

UNIT – V

5Thermal and Electrical methods

5.1 **Thermal methods:** Thermo gravimetric analysis- Principle, TG Curve, Instrumentation for TGA – Balance, Sample holder, Furnace, Temperature Measurement, Recorder, Thermo balance – Differential thermal analysis- Principle, Instrumentation- Thermometric Titration- Principle- Instrumentation.

5.2 Electro gravimetry: Theory, Instrumentation for constant methods, Potentio Static gravimetry- Instrumentation.

Polarography, Introduction , Apparatus, cells.

References

1. Principles of instrumental Analysis, Douglas A.Skoog, HRW International Editions
2. Fundamentals of Analytical Chemistry,7th ed., Douglas A.Skoog, Donald M.West and F.James Holler.
3. Instrumental Methods of Analysis, 7th ed., H.H.Willard, L.L.Merritt Jr., J.A.Dean and F.A.Settle,New York: Wadsworth, 1988.
4. Instrumental Methods of Chemical Analysis, GurdeepR.Chatwal and Sham Anand, Himalaya Publishing House.
5. Statistical Treatment of Experimental Tata, Young
6. Vogel's Text of Quantitative Inorganic Analysis, J.Basset, R.C Denney, G.H.Jeffery&J.Mendham, ELBS.
7. B.K Sharma, Instrumental methods of Chemical Analysis, GOEL Publishing House, Meerut.

CO – PO Mapping :

Instrumental Methods of Chemical Analysis **Code : 22KP1CHELCH1:1**

CO	PO									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	3	3	1	3	3	1	3	3	3	3
2	3	3	3	3	3	2	3	3	1	3
3	3	2	2	2	3	3	3	3	1	2
4	3	3	3	3	3	3	3	3	1	3
5	3	3	2	2	3	3	3	3	3	2

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SEM I	MBE1:2	MOLECULAR MODELLING AND DRUG DESIGN	22KP1CHELCH1:2	Ins.Hrs.6	Credit:4

CO	STATEMENT	
	After successful completion of the course, the students will be able to	
1	Know the basics in Molecular Modeling of compounds.	K1
2	Learn energy minimization methods through use of different forces fields	K1
3	Learn ESP plots by suitable software, Electron rich and electron deficiency sites.	K2
4	Carry out Molecular dynamics(MD)and Simulation on several molecules and polymers .	K4
5	Explain the HukelMolecuar orbitals and PPP methods.	K5
K1-Remember; **K2**-Understand;**K3**-Apply; **K4**-Analyse; **K5**-Evaluate **K6**-Create		

UNIT-I

Molecular Modeling Basics

Molecular Modeling- coordinates systems- Cartesian and internal coordinates systems-bond lengths-bond angles and torsion angles-distance matrix-stick models- space filling models-Potential energy surfaces- Molecular Mechanics- application and parameterization-advantages and limitations CA force fields.

UNIT – II

Potential Energy Surfaces: Intrinsic Reaction Coordinates, Stationary points-Local and global minima, concept of transition state with examples: Ethane, propane, butane, cyclohexane, Meaning of rigid and relaxed PES.

Applications of computational chemistry to determine reaction mechanisms.

Energy Minimization and Transition State Search: Geometry optimization, Methods of energy minimization: Multivariate Grid Search, Steepest Descent Method, Newton-Raphson method and Hessian matrix.

UNIT – III

Molecular Mechanics: Force Fields, Non-bonded interactions(Vander waals and electrostatic), How to handle torsions of flexible molecules, Vander waals interactions using Lennard-Jones potential, Hydrogen bonding interaction, Electrostatic term, Parameterization. Application of MM, Disadvantages and Software.

UNIT – IV

Molecular Dynamics: Radial distribution function for solids,Liquids and gases, Intermolecular potential(Hard Sphere, Finite square well and Lennard-Jones potential),Concepts of periodic box, Ensembles(Micro canonical, canonical, Isothermal-Isobaric),Ergodic Hypothesis. Integration of newton's equations(Leapfrog and Verlet algorithms), Rescaling, simulation of pure water- Radial distribution curves and interpretation.

UNIT –V

Hukel MO with Examples: Ethane, Propenyl, cyclopropenpyl systems, Properties calculated-Energy, Charges, Dipole moment, Bond order, Electronic energies, Resonance energies,Oxidation and Reduction(Cationic and anionic species of above systems). Extension to Extended Hukel theory and PPP methods.

References

1. A.R.Leach,"Molecular modeling principles and applications", 2nd Edition, Prentice Hall,2001.
2. Lewars,E." Computational Chemistry",Kluwer academic publisher,2003.
3. Cramer,C.J" Essentials of computational Chemistry",John Wiley and sons,2004.
4. Hinchcliffe,A"Modeling Molecular Structures" John Wiley and sons,1996.

CO – PO Mapping :

Molecular ModellingAnd Drug Design **Code: 22KP1CHELCH1:2**

CO	PO									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	3	2	2	3	2	3	3	3	2	3
2	2	2	2	2	1	1	2	3	1	1
3	3	2	2	3	2	1	3	3	1	1
4	3	3	1	3	3	1	3	3	1	3
5	3	2	1	3	3	3	3	3	1	1

1 – Low, 2 – Moderate, 3 – High correlation

21.3.2022

HOD of Chemistry,
Kunthavai Naachiyaar Government
Arts College for Women (Autonomous),
THANJAVUR - 613 007, TN.

CONTROLLER OF EXAMINATIONS
01 AUG 2022

SEM II	CC 5	ORGANIC CHEMISTRY – II	22KP2CH05	Ins.Hrs.7	Credit:5

CO	STATEMENT	
	After successful completion of the course, the students will be able to	
1	Understand the Reactions involved in Nucleophilic substitution	K2
2	Learn about the reactions involved in Electrophilic substitution	K1
3	Illustrate the various types of organic name reactions involving addition to carbonyl compounds and elimination reaction.	K5
4	Analyse the various types of reaction mechanism involved in Molecular Rearrangement	K4
5	Apply Various reagents in the organic synthesis by oxidation and reduction reaction.	K3
K1-Remember; **K2**-Understand;**K3**-Apply; **K4**-Analyse; **K5**-Evaluate **K6**-Create		

UNIT – I

1. Nucleophilic Substitution

1.1 Aliphatic Nucleophilic Substitution

S_N1, S_N2, S_Ni and neighbouring group mechanisms-substitution at an allylic carbon- aliphatic trigonal carbon and vinyl carbon.Effect of substrate, structure, leaving group, attacking nucleophile and solvent.Substitution in norbornyl and bridge head systems.Substitution by ambident nucleophiles.Typical nucleophilic substitution reactions Williamson's Menschutkin, Finkelstein, Von Braun and Wurtz reactions.

1.2 Aromatic Nucleophilic Substitution

S_NAr, S_N1, benzyne, SR_N1 mechanisms. Effect of substrate structure, leaving group, attacking nucleophile and solvent.Selected reactions – Ziegler alkylation, Chichibabin reaction- Reactions involving diazonium group as leaving group, Cine substitution – Von Richter reaction.

UNIT – II

2 Electrophilic Substitution

2.1 Aliphatic Electrophilic Substitution

SE_1, SE_2, SE_i mechanism. Effect of substrate structure, leaving group attacking eletrophile and solvent. Typical reactions to include migration of double bonds, keto-enoltautomerism, halogenation of carbonyl compounds, Friedel – Craft's acylation at olefinic carbon, Stark – Enamine reaction, reactions involving metals as electrophiles and as leaving groups- Decarboxylation of aliphatic acids-aliphatic diazonium coupling.

2.2 Aromatic Electrophilic Substitution:

Arenium ion mechanism- Orientation, Reactivity and mechanism based on transition state theory with suitable reaction, substituents effects- origin of Hammett equation- Principles of Hammett correlation- modified forms of Hammett equation.

UNIT – III

3. Addition and Elimination reactions

3.1 Addition to Carbonyl Compounds Mannich, Crossed Cannizzaro, Stobbe, Benzoin, Dorzon'sglycidic ester condensation, Witting reaction, Nazarov cyclization, Koch reaction.

3.2 Stereochemistry of Elimination of Hoffman and Saytzeff rules – Competition Between elimination and substitution reactions- Chugaev reaction dehydration of alcohols – dehydrohalogenation – Hoffman degradation – Cope elimination – Bret's rule- Bamford Stevens reaction, Epi-oxy elimination.

UNIT -IV

4. Molecular Rearrangement

4.1 Carbocation rearrangements

Wagner- meerwein and related 1,2 shifts, Dienone-Phenol, Schmidt , Baeyer-Villiger, Stevens, Sommelet- Hauser, Benzidine, Fries, Claisen and Hofmann rearrangements.

4.2 Carboanion rearrangements

Favorskii, Wolf, Wittig, Stork Enamine, Birch reduction, Dieckmann and Reformatsky

UNIT – V

5. Reagents in Organic Synthesis

5.1 Reduction

Catalytic hydrogenation and dehydrogenation selection in reduction- Reduction with $LiAlH_4$, $NaBH_4$ and hydrazine, DIBAL, Lithium di isopropylamide, Gilman's reagents, DDQ.

5.2 Oxidation

Oxidations with CrO_3, mCPBA, Swern Oxidation, periodic acid, Selenium dioxide, lead tetra acetate, Osmium tetroxide and H_2O_2.

References

1. *Advanced Organic Chemistry, Reactions, Mechanisms and Structure*, Jerry March, John Wiley & Sons.
2. *Stereochemistry of Carbon Compounds,* E.L. Eliel, McGraw Hill.

3. *Organic Chemistry* ,I.L. Finar, Vol.I& II, ELBS.
4. Chemistry of organic natural products Vol I & II , O.P. Agarwal, 1997 Goel Publications.
5 Advanced Organic chemistry, Parts A and B, Plenum, 3rd. edn., F.A. Carey and R.J. Sundburg, 1984.
6 .Photochemistry&Pericyclic reactions- Jagadambasingh, Jayasingh- New International.

CO – PO Mapping :
Organic Chemistry –II **Code: 22KP2CH05**

CO	PO									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	3	2	1	3	3	1	3	3	1	1
2	3	2	2	3	2	3	3	3	2	2
3	3	3	2	3	2	3	3	3	2	2
4	3	2	2	2	2	2	3	3	2	3
5	3	3	3	3	3	2	3	3	2	2

1 – Low, 2 – Moderate, 3 – High correlation

21.3.2022

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CONTROLLER OF EXAMINATIONS
01 AUG 2022

SEM II	CC 6	PHYSICAL CHEMISTRY – I	22KP2CH06	Ins.Hrs.7	Credit:5

CO	STATEMENT	
	After successful completion of the course, the students will be able to	
1	Understand the concepts of Classical, Quantum mechanics and Schrodinger wave equation.	K2
2	Know the advanced concepts of quantum chemistry.	K1
3	Gain the various concepts of electrochemistry.	K2
4	Apply group theory and categorize the molecules based on the structure and bonding interactions	K3
5	Classify the various type of adsorption isotherm and derive the reaction mechanism involved in surface phenomena	K6
K1-Remember; **K2**-Understand;**K3**-Apply; **K4**-Analyse; **K5**-Evaluate **K6**-Create		

UNIT I

1. Quantum Chemistry I

1.1 Classical Mechanics- General Principles and basic assumptions-inadequacy of classical mechanics- Wave, Particle dualism- de Broglie relation- Uncertainty Principle- Postulates of Quantum Mechanics- functions, operators and operator algebra- Linear vector space and operators in linear vector space-Eigen value and Eigen functions- Solving Eigen value equations by secular equations.

1.2 Setting –up of Schrodinger wave equation- Angular momentum operators and their eigen values- interpretation of amplitude and probability functions.

UNIT II

2. Quantum Chemistry II

2.1 Applications of wave mechanics to particles in one dimensional box and particle in a three dimensional box-Quantum numbers- Zero point energy-concept of Normalization and Orthogonality.

2.2 Spherical polar coordinates- Laplacian and angular momentum operators in terms of spherical angular coordinates (derivation not needed)- Rigid rotator- Harmonic oscillator- rotational and vibrational quantum numbers- selection rules for rotational and vibrational transitions- Bohr's correspondence principle- Hydrogen atom- shapes and nodal properties of orbitals.

UNIT III

3 Electrochemistry

3.1 Electro kinetic phenomena and it theories - Zeta potential - over potential or Over voltage, hydrogen over voltage, Butler-Volmer equation- Tafel equation.

3.2 Transport of ionic in solution: Debye-Huckel Theory- Debye-Huckel-Onsager equation of strong electrolytes – Verifications and Extensions of the Equation.

3.3 **Fuel Cells:** Definition, efficiency requirements- high temperature and low temperature fuel cells- H_2-O_2 fuel cells (Bacon fuel cell), hydrocarbon- oxygen fuel cells-applications. Lead – acid batteries – Cadmium – Nickel oxide batteries and Lithium ion battery.

UNIT IV

4. Group Theory

4.1 Symmetry elements and symmetry operations- point groups of molecules.Properties of a Group, sub-groups and classes- Abelian, cyclic and non-Abelian groups. Multiplication tables - matrix representation of geometric transformation- consequences of Great Orthogonality Theorem and construction of Character Table for C_{2v}, C_{3v} point groups- Character, reducible and irreducible representations

4.2 Applications of Group Theory: Evaluation of energies and MOs for system like ethylene,butadiene and benzene- hybridization schemes for σ and π bonding- symmetry adaped linear combinations(SALC) procedure. Symmetry functioning of secular determination of butadiene.

UNIT V

5. Surface Phenomena

5.1 Surface Phenomena: Adsorption and free energy relation at interfaces- Gibb's adsorption isotherm- physisorption and chemisorption- Langmuir and BET theory and derivation- surface area determination – Adsorption from solution.

5.2 Solid and liquid interface – wetting and contact angle – solid gas interfaces – soluble and insoluble films.

5.3 Heterogeneous Catalysis: Role of surface in catalysis- semiconductor catalysis- n and p-type surface- Kinetics of surface reactions involving adsorbed species. Langmuir-Hinshelwood mechanism- Langmuir-Rideal mechanism- Hydrogenation of ethylene.

References

1. *Mathematics for Quantum Chemistry,*J.M.Anderson, Benjamin.
2. *Introductory Quantum Chemistry,*A.K.Chandra, Tata-McGraw Hill.
3. *Quantum Chemistry,*R.K.Prasad, Wiley Eastern Ltd.
4. *Molecular Quantum Mechanics,*P.W.Atkins, Clarenden
5. *Quantum Chemistry,* Ira. N. Levine, Pearson Education.
6. *Chemical Kinetics,* K.J.laidler, Tata- McGraw Hill.
7. *Physical Chemistry*, P.W.Atkins,
8. *Physical Methods in Chemistry*, R.S.Drago, W.B.Sanders.
9. *Physical chemistry of surfaces by A.W. Adamson.*
10. *Molecular Symmetry and Group Theory by Robert L. Carter.*
11. *Chemical Applications of Group Theory by f. Albert cotton.*

CO – PO Mapping:

Physical Chemistry - I **Code : 22KP2CH06**

CO	PO									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	3	2	2	3	2	2	3	3	2	1
2	3	2	2	2	3	3	3	3	2	2
3	3	3	3	3	3	2	3	3	2	3
4	3	2	2	3	3	2	3	3	2	2
5	3	2	2	3	3	2	3	3	2	2

1 – Low, 2 – Moderate, 3 – High correlation

21.3.2022

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CONTROLLER OF EXAMINATIONS
01 AUG 2022

SEM II	CC 7 (P)	INORGANIC CHEMISTRY PRACTICAL - II	22KP2CH07P	Ins.Hrs.6	Credit:4

CO	STATEMENT	
	After successful completion of the course, the students will be able to	
1	Know the principles behind volumetric and gravimetric techniques.	K1
2	Separate the metal ions in binary mixtures.	K3
3	Estimate the metal ions.	K5
4	Comprehend the titration involving estimations of metals and hardness of water.	K2
5	Know the principles behind volumetric and gravimetric techniques.	K1
K1-Remember; **K2**-Understand;**K3**-Apply; **K4**-Analyse; **K5**-Evaluate **K6**-Create		

1. **Titrimetry and Gravimetry**

   Analysis of mixtures using volumetric and gravimetric methods.

   Cu (V) and Ni (G)
   Cu (V) and Zn (G)
   Fe (V) and Zn (G)
   Fe (V) and Ni (G)
   Zn (V) and Cu (G)

2. **Complexometric titrations involving estimations of Ca, Mg, Ni, Zn and hardness of water.**

3. **Preparation of the following complexes;**

   Tetramminecopper(II)sulphate
   Potassium trioxalatochromate(III)
   Potassium trioxalatoaluminate(III)
   Trithioureacopper(I) chloride
   Trithioureacopper(I) sulphate.

Reference:

1. Jeffery G.H, Bassett J, Mendham J and Danney R.C. Vogel, Text book of quantitative chemical analysis, 5th Ed., Longman Scientific and Technical Essex(1989).

CO – POMapping :

Inorganic Chemistry Practical-II **Code: 22KP2CH07P**

CO	PO									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	3	3	3	3	3	2	3	3	2	3
2	3	3	3	3	3	3	3	3	2	2
3	3	3	3	3	3	3	3	3	3	3
4	3	3	3	3	3	3	3	3	3	3
5	3	2	2	3	3	2	3	3	2	2

1 – Low, 2 – Moderate, 3 – High correlation

21.3.2022

HOD of Chemistry,
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THANJAVUR - 613 007, TN.

SEM II	CC8 (P)	ORGANIC CHEMISTRY PRACTICAL -II	22KP2CH08P	Ins.Hrs.6	Credit:5

CO	STATEMENT	
	After successful completion of the course, the students will be able to	
1	Understand the Quantitative analysis in organic chemistry.	K2
2	Analyse the oils, saponification of iodine value of an oil.	K4
3	Know the protocol for the preparation of an organic compound by double stage.	K1
4	Understand the various types of reaction through the preparation of organic compounds.	K2
5	Estimate the phenol, aniline, ketone, glucose and nitrobenzene	K5
K1-Remember; **K2**-Understand;**K3**-Apply; **K4**-Analyse; **K5**-Evaluate **K6**-Create		

1. Quantitative Analysis of Organic Compounds.
Estimation of phenol, aniline, ketone, glucose, nitrobenzene.

2. Analysis of oils: Saponification and Iodine values of an oil.

3. Preparation of organic compounds (Double Stage)

a) p-bromo acetanilide from aniline (Acetylation and Bromination)
b) Acetyl salicylic acid from methyl salicylate (Hydrolysis and acetylation)
c) P-nitroaniline from acetanilide (nitration and hydrolysis)
d) Benzanilide from benzophenone (rearrangement)
e) P-amino benzoic acid from p-nitro toluene (oxidation and reduction)

Reference

1. N. S. Gnanaprakasam, G. Ramamurthy, Organic Chemistry manual, S. Viswanathan Co. Ltd.,
2. Vogel text book of practical Organic Chemistry 5th edition, Prentice Hall, 2008.
3. Raj. K. Bansal, Laborratory manual of Organic Chemistry, 3rdEdn, New age international(P) Ltd., 1996.

CO – PO Mapping :

Organic Chemistry Practical –II **Code : 22KP2CH08P**

CO	PO									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	3	3	3	3	3	2	3	3	2	3
2	3	3	3	3	3	3	3	3	3	3
3	3	3	3	3	3	2	3	3	2	2
4	3	3	3	3	3	3	3	3	2	3
5	3	3	3	3	3	2	3	3	2	2

1 – Low, 2 – Moderate, 3 – High correlation

21.3.2022

HOD of Chemistry,
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THANJAVUR - 613 007, TN.

CONTROLLER OF EXAMINATIONS
01 AUG 2022

SEM II	NME 1	HEALTH CHEMISTRY	22KP2CHELO1	Inst.Hrs 4	Credit 3

CO	STATEMENT	
	After successful completion of the course, the students will be able to	
1	Learn the importance of basic nutrients and maintenance of good health	K1
2	Understand the classification of carbohydrates, proteins and vitamins	K2
3	Gain knowledge on drugs and their mode of action	K1
4	Learn the function of body fluids	K4
5	Learn the various types of vitamin deficiency diseases	K4
K1-Remember; **K2**-Understand;**K3**-Apply; **K4**-Analyse; **K5**-Evaluate **K6**-Create		

Unit – I Health and its maintenance

Health – Mental health and physical health – Food Pyramid – Types of malnutrition – causes and remedies – Macro and micronutrients – Carbohydrates – Classification and their Biological functions of Proteins, Vitamins and Minerals (Fe, Ca, P, Na and K)

Unit – II Drugs and their functions

Drugs – Classification of drugs – Drugs acting on CNS – General Anaesthetics, Hypnotics and Sedatives, Narcotics, Antipyretics, Antirheumatics, Analgesics, Anticonvulsants and Antitussives – chemotherapeutic drugs – antibiotics, antiseptics and disinfectants – Cardiovascular agents – Anti cancer drugs.

Unit – III Body fluids

Blood volume, Blood groups, Functions of blood, blood pressure, anemia, blood sugar, haemoglobin – chemistry of respiration – urine – electrolytebalance.

Unit – IV Enzymes, Hormones and Digestion

Enzymes – Types and their action – Hormones and their biological functions – digestion in mouth, stomach, intestine and pancreas.

Unit – V Common and vitamin Deficiency Diseases

Jaundice, Typhoid, Dengue, Ulcer, Goiter, Diabetes, Rickets, Scurvy, Beriberi, Pellagra, Night Blindness – symptoms, causes and treatments.

Reference

1. Alex V Ramani, *Food Chemistry*, MJP Publishers, Chennai, 2009.
2. Deb A C, *Fundamentals of Biochemistry*, New Central Book Agency, Calcutta, 1994.
3. Satake M and Mido Y, *Chemistry for Health Science*, Discovery Publishing House, New Delhi, 2003.
4. JayashreeGhosh, *A Text book of Pharamaceutical Chemistry*, S. Chand and Co., Ltd., 1999.
5. AshutoshKar, Medicinal Chemistry, Wiley Eastems Limited, New Delhi, 1993.

CO – PO Mapping :

Health Chemistry **Code: 22KP2CHELO1**

CO	PO									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	2	2	2	3	2	3	2	3	3	3
2	2	3	2	3	2	3	2	2	2	3
3	3	3	3	3	3	3	3	3	3	3
4	3	2	2	3	2	3	2	3	2	2
5	3	2	2	3	2	3	2	2	2	2

1 – Low, 2 – Moderate, 3 – High correlation

21.3.2022

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CONTROLLER OF EXAMINATIONS
01 AUG 2022

SEM II	ECC1	CHEMISTRY IN EVERYDAY LIFE	22KP2ECCCH1:1	Ins.Hrs. -	Credit:3

CO	STATEMENT	
	After successful completion of the course, the students will be able to	
1	Know the composition of milk and its applications.	K1
2	Apply the basic concepts of chemistry in the manufacture of commercial products for the society.	K3
3	Understand the domestic accidents and prevention methods.	K2
4	Have the knowledge about the insecticides, pesticides, food poisoning and controlling methods.	K5
5	Define the terms of adulterated food and contaminated process of food with toxic chemicals and metals.	K1
K1-Remember; **K2**-Understand;**K3**-Apply; **K4**-Analyse; **K5**-Evaluate **K6**-Create		

UNIT – I Milk and Milk Products

1.1 Composition of milk – variation in composition of milk from different sources – other causes for variation – commercial milk – whole milk, low fat, skim, low sodium milk. Nutritive value of milk – testing the purity of milk - pasteurization, sterilizationand homogenization.

1.2 Milk products – sour cream, yogurt, butter milk, butter, kefir, butter oil, ghee, evaporated milk, condensed milk, ice cream, cheese and whey – brief account of composition.

UNIT – II Cosmetics and Cleaning Agents

2.1 Classification of cosmetics – Ingredients and effects of Face Cream, Cold Cream, Hand Lotion, Nail Polish, Lipstick, Rouge, Eye Make-up, Pre and After-Shave, Toilet Powder, Hair Remover and Hair Dye.

2.2 Soaps and Detergents-Washing Soaps, Toilet Soaps, Detergents and Shampoos – Ingredients, composition and small-scale preparation. Benefits and Hazards of usingcosmetics.

UNIT – III Domestic Accidents and prevention

3.1 Due to Fire: Cause of fire in home-Types of fire – fire protection and fire prevention – First Aid to fire accident victims – Dos and Don'ts with fire.

3.2 Due to electric shock: Causes of electric shock – care and maintenance of electrical appliances – Dos and Don'ts with electricity.

3.3 Due to drugs: Common types of OTC (over the counter) drug found in houses – misuse and overuse of drugs – hazards of misusing drugs – Dos and don'ts with common household medicines.

UNIT – IV Pesticides and Insecticides

4.1 Due to Pesticides and Insecticides: Common remedies for household pests- mosquitoes, flies ants, bed-bugs, cockroaches, silverfish, cloth moths, termites, ticks, lice and rodents. Precaution in application of pesticides and insecticides. First aid measures for pesticide poisoning – toxicity and hazards of pesticides.

4.2 Due to food-poisoning: by microorganism, insects and rodents. Prevention and control of food –poisoning.

UNIT – V Common Adulterants and Contaminants in Food

5.1 Definition of adulteration food- Food Standards in India-ISI, Agmark-Common adulterants in

(i) Milk and Milk Products
(ii) Vegetable fats and oils
(iii) Wheat products
(iv) Pulses
(v) Honey
(vi) Beverages
(vii) Spices

Chemical tests for the detection of adulterants.

5.2 Contaminants: Contamination of food with toxic chemicals – Toxic effects of metals, pesticides, food additives, solvent residues, animal feed additives etc., - contamination of food with harmful microorganism – bacterial, fungal and parasitic contamination.

Reference

1. Essentials of Food and Nutrition, M. Swaminathan, Bappco, The Bangalore Printers and Publishing company Ltd. Vol. I & II.
2. Food Science and Experimental Foods, M.Swaminathan, Ganesh & Company, Chennai.
3. Perfumes, cosmetics and Soaps, W. A. Poucher, B.I. Publication, Chapman & Harold Macy, Tata McGraw Hill.
4. Principles of Dairy Chemistry, Robert Jones and Stuart Patton, Wiley Eastern Pvt. Ltd.
5. Fundamental of Dairy Chemistry, B.H. Webb, A. H. Johnson & J.A. Alford, CBS Publishers and Distributors

CO – PO Mapping :

Chemistry in Everyday Life **Code :22KP2ECCCH1:1**

CO	PO									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	3	3	2	3	3	3	3	3	3	3
2	3	3	3	3	3	3	3	3	3	3
3	3	2	3	3	3	3	3	3	3	3
4	3	3	3	3	3	3	3	3	3	3
5	3	3	3	3	3	3	3	3	3	3

1 – Low, 2 – Moderate, 3 – High correlation

21.3.2022

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CONTROLLER OF EXAMINATIONS
01 AUG 2022

SEM II	ECC2	TEXTILE CHEMISTRY	22KP2ECCCH2	Ins.Hrs. -	Credit:4

CO	STATEMENT	
	After successful completion of the course, the students will be able to	
1	Define the dyes,classification and dyeing assistants.	K1
2	Identify the different types of fibre and clothes.	K4
3	Comprehend the operations in dyeing process.	K2
4	Discover the various methods dyeing process.	K6
5	Illustrate the pigments,fluorescent brightening agents and non textiles uses of dyes.	K4
K1-Remember; **K2**-Understand;**K3**-Apply; **K4**-Analyse; **K5**-Evaluate **K6**-Create		

UNIT I

1.1 Dyes-Definition-Requisites of a true dye.Bathochromic and Hypsochromic effects.Colour and Constitution-Witt's theory-chromophore-auxochrome-Armstrong's theory.Modern theories-Valence bond theory-Molecular orbital theory.

1.2 Classification of dyes-based on their structure and on their application.Important properties of dyes.

1.3 Dyeing assistants-Wetting agent,Levelling agent,Exhausting agent,Dispersing agent and Mordant.

UNIT II

1.1 Fibre classification-natural,semisynthetic,synthetic fibres.Chemical nature of cellulosic and protieneousfibres.Types of forces between fibres and dyes.

1.2 Preparation and properties ofNylon 6,6Polyster and Viscose.

1.3 Identification test for cotton,wool,silk,viscose,nylon,polyster and jute.

UNIT III

3.1 Operating in Dyeing process-Sizing and Desizing.Desizing methods-Rot stripping-Acidstripping.Scouring-Acid and alkali Scouring.Bleaching methods –Peroxide bleaching –using bleaching powder.

3.2 Dye bath recipe model-ML ratio,pH,temperature,% of exhaustion,%shade.

UNIT IV

4.1 Various methods of dyeing-Direct dyeing,vat dyeing,mordant dyeing,disperse dyeing-Reactive dyeing-Principle involved in the dyeing process.Vat dyeing-dyeing procedure – oxidation.Dyeing of cotton with direct reactive dyes,sulfur dyes,Azoic dyes.

4.2 Dyeing of silk with acid dye-metal complex dyes.Dyeing of polyster with dye using carrier.

UNIT V

5.1 Pigments-requirements of organic pigments-types of pigments-uses.
5.2 Fluorscent brightening agents-characteristics properties-classification.
5.3 Non textile uses of dyes-leather dyes-paper dyes-food colours –solvent dyes – wood dyes-medicinal dyes-photography-cosmetic dyes-indicators and reagents-flourescent dyes.

REFERENCE

1. V.A.Shenai-An introduction to dyes stuff and intermediate-sevak publications-Bamby.
2. V.A.Shenai-Textile fibres-sevak publications.
3. F.R.Trocmann-Dyeing chemical Technology of Textile Fibres.
4. ER.Trotman-Textile Scouring and bleaching,Charless,Griffins Co.,
5. V.A.Shenai-Technology of dyeing,Vol.I,III
6. GurdeepR.Chatwal-Synthetic dyes,Himalaya publishing House.

CO – PO Mapping :

Textile Chemistry **Code : 22KP2ECCCH2**

CO	PO									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	3	3	3	3	3	3	3	3	2	3
2	3	3	2	3	3	3	3	3	3	3
3	3	3	2	3	3	3	3	3	3	3
4	3	3	2	3	3	3	3	3	3	3
5	3	3	2	3	3	3	3	3	2	3

1 – Low, 2 – Moderate, 3 – High correlation

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SEM III	CC 9	ORGANIC CHEMISTRY – III	22KP3CH09	Ins.Hrs.7	Credit:5

CO	STATEMENT	
	After successful completion of the course, the students will be able to	
1	Emphasize the students regarding the fundamentals of photochemistry and various photochemical reactions in detail.	K5
2	Apply the concept of Photochemistry in Organic compounds	K3
3	Know the various type of synthetic routes of pericyclic reactions	K1
4	Understand the structural elucidation and synthesis of alkaloids, terpenoid, Steroids and antibiotics.	K2
5	Illustrate the basic concept of organic reactions involved in Green Chemistry	K4
K1-Remember; **K2**-Understand;**K3**-Apply; **K4**-Analyse; **K5**-Evaluate **K6**-Create		

UNIT – I

Organic photo chemistry

Introduction –Photophysical processes in Electronically excited molecules- Jablonski diagram- energy transfer characteristics of photo reaction and photooxidation- Quenching of Fluorescence- Stern Volmer equation- Chemical Actinometers - photoreductionof ketones and enones- Norrish type I & II reactions- photo sensitization- photo additions- Barton reaction- Flash Photolysis- Stopped Flow techniques.

UNIT – II

Photochemistry of organic Compounds

Intramolecular reactions of the olefnic bond, Carbonyl compounds- Saturated, cyclic and acyclic, β,γ- unsaturated and α, β –unsaturated compounds- Geometrical isomerism- Cyclisation reactions, rearrangement of 1,4 and 1,5 – dienes- Intermolecular cycloaddition reactions- dimerization and Oxetane formation, Paterno- Buchi reaction - Isomerisation, additions and substitutions of aromatic compounds.

UNIT –III

3 . Pericyclic Reactions

Molecular Orbital Symmetry - Frontier Orbital of Ethylene, 1,3 Butadiene, 1,3,5 Hexatrienes and Allyl system. Classification of Pericyclic Reactions. Woodward – Hofmann Correlation diagram - FMO and PMO approach. Electrocyclic reactions - Conrotatory and Disrotatory motions- 4n, 4n+2 and allyl systems, Cyclo additions – antarafacial and suprafacial additions, 4n and 4n+2 systems,

2+2 addition of ketenes. Sigmatropic rearrangements – Suprafacial and antara facial shifts of H, sigmatropic shifts involving carbon moieties, 3,3– sigmatropic rearrangements- Claisen, Cope and Aza – Cope rearrangements. Fluxinolaltautomerism –Ene reaction.

UNIT – IV

4. Natural Products.

4.1 Alkaloids: Structural elucidation and synthesis of Papaverin and Morphine.

4.2 Terpenoids: Structural elucidation and Synthesis of α -Pinene, Camphor and Zingiberene.

4.3 Steroids: Structural elucidationand Synthesis of Cholesterol, conversion of Cholesterol to Progesterone and cortisone.

4.4 Antibiotics: Structure and synthesis of Pencillin, Streptomycin and Cephalosporin.

UNIT - V

5.Green Chemistry

Designing a green synthesis, basic principles and applications of green chemistry- Phase transfer catalyst- synthesis and applications , Quaternary ammonium salt, crown ethers, polymer supported reagents, Elementary idea of microwave synthesis – Neat Reactions, Solid supports reactions, Functional Group transformations, Condensation Reactions, Oxidation reactions, Reduction reactions, multi - component reactions.

References

1. *Advanced Organic Chemistry, Reactions, Mechanisms and Structure*, Jerry March, John Wiley & Sons.
2. Advanced Organic Reaction Mechanism P.S.Kalsi
3. Organic Reaction Mechanism R.K.Bansal, Tata McGraw Hill.
4. Applications of Spectroscopy of Organic Compounds, J.R. Dyer, Prentice Hall. Introduction to Molecular Spectroscopy, G.M. Barrow, McGraw Hill.
5. Elementary Organic Spectroscopy, Principles and Chemical Applications,Y.R.Sharma , S.Chand& Company Ltd.
6. Spectrometric Identification of Organic Compounds,R.M.Silverstein and F.X.Webster, John Wiley & Sons.
7. Organic Spectroscopy,W.Kemp, MacMillan.
8. Spectroscopy of OrganicCompounds, P.S.Kalsi, New Age International Publishers.

CO – PO Mapping :
Organic Chemistry –III **Code : 22KP3CH09**

CO	PO									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	3	3	2	3	3	3	3	3	2	2
2	3	3	2	3	3	3	3	3	2	2
3	3	3	3	3	3	3	3	3	2	3
4	3	3	3	3	3	3	3	3	2	3
5	3	2	3	3	2	3	3	3	2	3

1 – Low, 2 – Moderate, 3 – High correlation

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SEM III	CC 10	SPECTROSCOPIC METHODS	22KP3CH10	Ins.Hrs.7	Credit:5

CO	STATEMENT	
	After successful completion of the course, the students will be able to	
1	Understand the basic principle and transitions involved in UV	K2
2	Learn the principles and concept of IR and Raman spectroscopy.	K1
3	Acquire the keen knowledge from electronic spectroscopy and NMR spectroscopy.	K6
4	Know the basic principles of ESR and NQR	K1
5	Illustrate the concept of Mass, Massbauer spectroscopy and the Combined spectroscopic problems	K5
K1-Remember; **K2**-Understand;**K3**-Apply; **K4**-Analyse; **K5**-Evaluate **K6**-Create		

UNIT –I

1.1 Ultraviolet and Visible Spectroscopy.

Introduction – Electronic Transitions and Selection rules- Orgin, General appearance and designation of UV bands- Absorption law- Measure of absorption intensity- Chromophores and Auxochromes- Various Shifts- Bathochromic shift, Hypsochromic shift, Hyperchromic effect, Hypochromic effect,Isosbestic point, Factors affecting the position of UV bands, Fischer – Woodward rules for Conjugated Dienes and Carbonyl Compounds, Ultraviolet Spectra of Aromatic and Heterocyclic Compounds. Steric effect in Biphenyls.

UNIT – II

2.1 Infrared spectroscopy: Selection rule-The diatomicvibrating rotator-- Harmonic and Anharmonic oscillator-.The interaction of rotations and vibrations-Vibrations of poly atomic molecules.Parallel and perpendicular bonds-Calculations of force constants,anharmonicityconstants, Fermi resonance, dissociation energy and zero point energy-isotopicsubstitution.

2.2 Infrared Spectroscopy

Characteristic vibrational frequencies of Alkanes, Alkenes, Alkynes, Aromatic compounds, Alcohols, Esters, Phenol and Amines. Detailed study of vibrational frequencies of Carbonyl Compounds (ketones, aldehydes, esters, amides, acids, anhydrides, lactones and conjugated carbonyl compounds). Effect of Hydrogen Bonding and Solvent Effect on Vibrational frequencies.

2.3 Raman spectroscopy:selection rules-pure rotational Raman spectra-Vibrational Raman spectra- Raman Scattering-Comparison of IR and Raman spectra-

Techniques and Instrumentations(principles only).Structuraldeterminations of simple molecules.

UNIT –III

3.1 Proton Magnetic Resonance Spectroscopy.

General introduction to NMR- Correlation of Protons bonded to carbon (aliphatic and aromatic) and other nuclei (hydrocarbons, alcohols, phenols, carboxylic acids, amines, amides, carbonyl compounds and esters), Chemical exchange, Effect of Deuteration, Spin – Spin interaction including long range coupling (first order spectra), Virtual Coupling. Simplification of complex spectra - nuclear magnetic double resonance, contact shift reagents, solvent effects. Fourier transform technique, Nuclear Overhauser Effect (NOE).

3.2 Carbon 13 - NMR Spectroscopy

General considerations - Chemical Shift (aliphatic, olefinic, alkynes, aromatic, Hetero aromatic and carbonyl carbon), coupling constants. Two dimension NMR spectrometry – COSY, NOESY and DEPT techniques.

UNIT-IV

4.1 ESR spectroscopy: Basic principles and features of ESR spectra – line shapeand line widths-the g-value-spin densities and Mcconnel relationship – hyper fine splitting-origin of hyperfine interactions-ESR and molecular orbital theory –zero field splitting and krammer's degeneracy in ESR-applications of ESR to some simple systems.

4.2 **NQR spectroscopy:** Characteristics of Quadrupolar nucleus – Effect of field gradient and magnetic field upon Quadrupolar energy levels, NQR Transition – Applications of NQR Spectroscopy.

UNIT -V

5.1 Mass Spectroscopy

Introduction – Principles - molecular ion peak, metastable peak, Isotope Peaks, Mc Lafferty Rearrangement - Nitrogen Rule - Mass Spectral fragmentation of Organic Compounds with respect to their structural determination.

5.2 Massbauer Spectroscopy- Basic principles- Spectral parameters, Spectrum display and isomer shift

Application of the technique to the studies of

1. Bonding and structure of Fe^{+2} and Fe^{+3}componds including those of Intermediate spin
2. Sn^{+2} and Sn^{+4} compounds- nature of M-L bond, Co-ordination number, structure

5.3 Combined spectroscopy problems.

References:

1. C.N.Banwell.Fundamentals of molecular spectroscopy,,Tata McGraw Hill .
2. R.S.Drago,Physical methods for chemistry.Saunders Company
3. G.Bartow , "Introduction to molecular spectroscopy", McGraw-Hill .
4. P.K.Ghosh,"Introduction to Photo electron spectroscopy" John Wiley.
5. R.Chang, "Basic Principles of Spectroscopy",McGraw Hills.
6. .J.M.Hollas, "Modern Spectroscopy",John Wiley.
7. J.R.Dyer, "Applications of Spectroscopy of Organic compounds",Prentice Hall.
8. Y.R.Sharma, "Elementary Organic Spetroscopy,Principle and applications",S.chand and Company Ltd.
9. Jag Mohan, Organic spectroscopy Principles and Applications, Narosa Publishing House, IIndedition, 2004.

CO – PO Mapping:

Spectroscopic Methods **Code: 22KP3CH10**

CO	PO									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	3	3	2	3	3	3	3	3	2	2
2	3	3	2	3	3	2	3	3	2	3
3	3	3	3	3	3	2	3	3	2	3
4	3	3	3	3	3	2	3	3	2	3
5	3	3	2	3	3	3	3	3	2	3

1 – Low, 2 – Moderate, 3 – High correlation

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SEM III	CC 11(P)	PHYSICAL CHEMISTRY PRACTICAL - I	22KP3CH11P	Ins.Hrs.-6	Credit:5

CO	STATEMENT	
	After successful completion of the course, the students will be able to	
1	Explain the principle behind the experiments and interpret the experimental results.	K2
2	Study the kinetics of the chemical reaction.	K5
3	Learn the concept of polarimeter.	K1
4	Understand the principles and applications of adsorption	K2
5	Estimate the molecular weight of additional solute by rast and thermometric method.	K6
K1-Remember; **K2**-Understand;**K3**-Apply; **K4**-Analyse; **K5**-Evaluate **K6**-Create		

1. Comparison of strength of acids 'A' and 'B' by determining rate constants of hydrolysis of an ester.
2. Determination of energy of activation frequency factor and temperature coefficient.
3. Determination of velocity constant and order ofof the reaction between potassium persulphate and potassium iodide.
4. A study of Primary salt effect.
5. A study of adsorption of oxalic acid on charcoal.
6. Effect of impurity on C.S.T of phenol-water system
7. Determination of transition temperature of the hydrated salt.
8. Determination of the molecular weight of given solute by the depression of freezing point method (Rast method).
9. Phase diagram for two components with simple eutectic system.
10. Determination of rate constant of inversion of sucrose by polarimeter and verification of the effect of catalyst on the rate constant.
11. Construction of phase diagram of a three component system containing ethanol,benzene and water.
12. 12.Determination of equilibrium constant for the reaction between KI and I_2.
13. Determination activity coefficient of electrolyte.
14. Studies on the kinetics saponification of ethyl acetate by NaOH.
15. Iodination of acetone for determining order of reaction.

CO – PO Mapping :
Physical Chemistry Practical –I **Code : 22KP3CH11P**

CO	PO									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	3	3	3	3	3	2	3	3	2	2
2	3	3	3	3	3	2	3	3	2	2
3	3	3	3	3	3	3	3	3	2	3
4	3	3	3	3	3	3	3	3	2	3
5	3	3	2	3	1	3	3	3	2	2

1 – Low, 2 – Moderate, 3 – High correlation

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SEM III	MBE 3:1	RESEARCH METHODOLOGY & RECENT TRENDS IN CHEMISTRY	22KP3CHELCH3:1	Ins.Hrs.-6	Credit: 4

CO	STATEMENT	
	After successful completion of the course, the students will be able to	
1	Learn the types of sampling techniques, selecting the research problem, data analysis, preparation of manuscript, seminar presentation, computer searches and literature.	K1
2	Acquire the knowledge in computer application of the C- programming and also applications with Bohr radius, various types of velocity of gas molecules and rate constant for a first order reaction.	K2
3	Know the principle, instrumentation and applications of GC-MS, HP-TLC, LC-MS and solvent extraction methods.	K3
4	Define and understand the applications of various types of Nano Sized materials.	K5
5	Learn the concept of Retrosynthetic analysis and supramolecular chemistry.	K1
K1-Remember; **K2**-Understand;**K3**-Apply; **K4**-Analyse; **K5**-Evaluate **K6**-Create		

Unit – I

2. Research Methodology

Selection of the research problem-Sampling techniques – random sampling-data collection, processing and analysis of data, thesis writing – bibliography - preparation of manuscripts-full paper,preparation of seminar paper for oral presentation,short communications-review paper, use of computer browsing for literature search and downloading-basics of Internet services-various sources of abstracts,articles and papers for browsing and downloading**.**

Unit- II

2. Computer applications

2.1 C-Programming

a) Structure of a C program- Data types,Variables,Constants,Keywords,Operators,Expression.

b)Control structure-if, if-else,nested if-else,while,while-do,for,nestedfor,goto,continue,break,switch case statements.

2.2 C-Programming - Applications

a) Arrays-user defined functions(recursion, call by value and callby reference)-String functions.

b) Pointers-pointer Expressions, Introduction to OOPS.

2.3 Applications

(i) Bohr radius

(ii) Average,RMS and Most probable Velocities of gas molecules

(iii) Rate constant for a first order reaction

Unit-III

3. Hyphenated Techniques

3.1 GC-MS,HP-TLC,LC-MS etc,Principle and applications.

3.2 Ion Exchange and affinity chromatography principle and applications.

3.3 Solvent Extraction method in analysis-principle, classification, theory,instrumentations and applications.

Unit-IV

4. Nanochemistry

4.1 Introduction-definition of nanodimensionalmaterials,size effect ,importance of Nanomaterials,simple examples of unique properties of nanosizedmaterials,Investigation of materials in the nanoscale-electron microscope.Carbon clusters and nano structure-Nature of carbon bond,carbonclusters,cluster formation and growth,Fullerenes-Discovery of C_{60} , super conductivity in C_{60} , larger and smaller fullerenes.

4.2 Carbon nano tube-synthesis and purification of carbon nano tube-mechanism of growth,properties,application of carbon nanotube,Nano wires-properties and applications.Semi conductor Quantum Dots.Nano medicines-for oral &Nasal administrations,diagnosticapplicaton.Goldnano particles.

Unit- V

5. New synthetic methods

5.1 Retro synthetic analysis of mono and difunctional open chain target molecules.Retrosynthetic analysis of monocyclic and bicyclic target molecules.Modern methods of functional group interconversionsinvolving C=O,CHO,-OH,-SH,-COOH,C=C,
$-NH_2$,-COOR functional groups.

5.2 Supramolecularchemistry:Introduction,Crown ethers-synthesis of [18]Crown-6,bibenzo-18-Crown-6,diamino Crown and azocrown,Application of crown ethers-Phase transfer catalysis.Catenanes and their synthesis.

References:

1. Anderson,"Thesis and assignment writing" Prentice Hall.
2. K.V.Raman,"Computer in chemistry",Tata McGraw Hill.New Delhi,1990.
3. E.Balagurusamy,"Progrmming in C",Tata McGraw Hill.New Delhi,1991

4. M.M.Sharma,Green chemistry Environmentally Friendly Alternatives,(2006)Narosa publishing House Pvt.Ltd.,New Delhi.
5. V.K.Ahluwalia,Green chemistry Environmentally Benign Reaction,(2006)Ane Books India,New Delhi
6. T.Pradeep,Nano The Essentials(2007) Tata McGraw Hill publishing company limited New Delhi
7. P.S.Kalsi,J.P.Kalsi, Bioorganic,Bio inorganic and Supramolecular chemistry,(2007)New Age International(P) Ltd,publishers.
8. Skoog DA, Loory JI and saunder WB, Principles of Instrumental Analysis.
9. Skoog DA, West DM, Holler Fj and saunder WB, fundamentals of Analytical chemistry.
10. Basic concepts of Analytical chemistry by S.M. Khopkar- New age International Publishers.
11. F.J. welcher: standard methods of chemical anaisis, 6th Ed. Vol. I and II.

CO – PO Mapping :
Research Methodology & Recent Trends in Chemistry
Code : 22KP3CHELCH3:1

CO	PO									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	3	3	2	3	2	2	3	3	2	2
2	3	3	2	3	2	3	3	3	3	3
3	3	3	3	3	3	3	3	3	2	3
4	3	3	3	3	3	3	3	3	2	3
5	3	3	3	3	3	2	3	3	2	2

1 – Low, 2 – Moderate, 3 – High correlation

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SEM III	MBE 3:2	ELECTRO ANALYTICAL CHEMISTRY	22KP3CHELCH3:2	Ins.Hrs. 6	Credit: 4

CO	STATEMENT	
	After successful completion of the course, the students will be able to	
1	Learn the principles of electrochemical methods such as steady state,potential step techniques and electrode and electrolyte interface.	K1
2	Explain the models of interface of double layer.	K5
3	Understand the applications of SECM,STM,AFM and AEM.	K2
4	Summarize the types of electrode reaction, charge transfer reaction and derive the Butler-Volmer equation.	K6
5	Analyse electrochemical reaction through voltammetry, amperometry and coulometry	K4
K1-Remember; **K2**-Understand;**K3**-Apply; **K4**-Analyse; **K5**-Evaluate **K6**-Create		

UNIT I Introduction to Electrochemistry

1.1 Principles of electrochemical methods-Electrochemical reactions –steady state and potential step techniques.

1.2 Superconducting magnets-thermodynamic and transport properties of aqueous and non-aqueous electrolyte-the electrode/electrolyte interface-and the kinetics of electrode processes.

UNIT II Models of Inerface

2.1 Different models of double layer-Parallel plate model-Guay chapman model-Stern Helmholtz model-Electrical Double Layer mathematical description.

2.2 Competition between water and organic molecules at the interface.

UNIT III Scanning Probe Techniques

3.1 Introduction,Principles and Electrochemical applications:Scanning-Electrochemical Microscope(SECM)-Scanning Tunneling Microscope(STM)

3.2 Instrumentation and application:Atomic Force Microscope (AFM)-Atomic Electro Microscope(AEM).

UNIT IV Electrodics

4.1 Introduction-types of electrodes reaction-various types of over potential-Exchange Current, Density-Derivation of Butler Volmer Equation-Over Potential relations at different condition.

4.2 Charge transfer reactions-Determination and mechanism of kinetic parameters like exchange current,Tafelconstants,stoichiometric number and activation energy.

UNIT V Instrumental TechnquesIn Electrochemistry

5.1 Fundamentals of Electroanalytical methods-Voltammetry-Amperometry-Coulometry-Hydrodynamic voltammetry.

5.2 Applications of Voltammetry-Anodic and Cathodic Stripping Voltammetry-Chronopotentiometry-Chronoamperometry-Pseudo Poloragraphy for specification studies.'

REFERENCE

1. J.O.M .Bockris and A.K.N Reddy,Modern Electrochemistry –Vol I &II,A Plentium Edition,NewYork,1970.
2. D.A.Bonnell,ED.,"Scanning Tunneling Microscope and Spectroscopy-Theory,Techniques and Applications",VCH NewYork,1993.
3. Allen.J.Bard&Faulkner,Electrochemicalmethods,Fundamentals&Application,John Wiley & Sons,NewYork,1983.
4. R.Mukundan,Electrochemical Scanning probe microscopy,Washington,2007.
5. E.Gileadi,ElectrodeKinetics,VCH Publishers,Inc.NewYork,1993.
6. B.H.Vassons and G.W.Ewing,Electro Analytical Chemistry,John Wiley S sons,NewYork,1983.

CO – PO Mapping :

Electro Analytical Chemistry **Code : 22KP3CHELCH3:2**

CO	PO									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	3	3	2	3	1	2	3	3	2	3
2	3	3	2	3	1	2	3	3	2	3
3	3	3	3	3	3	3	3	3	2	3
4	3	3	2	3	3	1	3	3	2	1
5	3	3	3	3	3	3	3	3	2	3

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SEM III	NME 2	POLLUTION AND ITS CONTROL MEASURES	22KP3CHELO2	Inst.Hrs. 4	Credit: 3

CO	STATEMENT	
	After successful completion of the course, the students will be able to	
1	Identity pollutants and their effect on environment and human health	K5
2	Describe the analytical methods to determine water and air quality parameters	K4
3	Propose water treatment methods for domestic and industrial purpose	K2
4	Create environmental awareness in society	K6
5	Know the types of pollutions and control measures	K2
K1-Remember; **K2**-Understand;**K3**-Apply; **K4**-Analyse; **K5**-Evaluate **K6**-Create		

Unit - I Air Pollution

Major regions of the atmosphere – composition of air – specific air pollutants and their effects – CO, CO_2, SO_2, SO_3, NO and NO_2 – ozone depletion – acid rain – photochemical smog and degradation of metals present in industrial water.

Unit – II Water Pollution

Criteria for potable water – major water pollutants – organic, inorganic, heavy metals – (As, Cr, Fe, Pb, Cd, Hg) oil spills – sources –effects.

Unit – III Soil and Pesticide Pollution

Sources, effects of various oil pollutants – pesticides – classification. Toxicity of DDT, BHC, malathion, parathion, carbamates. Alternative sources for pesticides, types of soil pollution.

Unit – IV Noise and Nuclear Pollution

Noise pollution – sources and effects – nuclear pollution – genetic and somatic effects – nuclear disasters and major accidents.

Unit – V Analysis and Control methods

Sampling of air and water pollutants – analysis of DO, BOD, COD, and TOC in water- Analysis of CO by GC, NO by chemiluminescence and CO_2 by spectrometry. Treatment of water for domestic and industrial purpose – primary, secondary and tertiary treatment methods.

Reference

1. Environmental Chemistry, A.K. De, 5thEdn., New Age International Publisher, 2005.
2. Environmental Chemistry, B.K. Sharma, 11thEdn., Krishna Prakashan Media Limited, 2007.

CO – PO Mapping :

Pollution and its control measures **Code: 22KP3CHELO2**

CO	PO									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	3	3	2	3	3	3	3	3	3	3
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4	2	3	2	2	3	3	3	3	3	3
5	2	3	3	3	3	3	2	3	3	3

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SEM III	MBE 4:1	MEDICINAL CHEMISTRY	22KP3CHELCH4:1	Ins.Hrs.-6	Credit: 4

CO	STATEMENT	
	After successful completion of the course, the students will be able to	
1	Learn the chemistry of biomolecules.	K2
2	Describe the physiological aspects of drugs, drug absorption, distribution, metabolism, excretion, drug design and drug receptors.	K5
3	Formulate the synthesis of few important drugs such as cardiovascular drugs and analgesics.	K6
4	Know the importance of various types of Anaesthetics, Antibiotics and Harmones.	K1
5	Acquire the knowledge in pharmacodynamics.	K2
K1-Remember; **K2**-Understand;**K3**-Apply; **K4**-Analyse; **K5**-Evaluate **K6**-Create		

Unit I

1. Chemistry of Biomolecules

1.1 Metabolism of Biomolecules, Disorders relating to Metabolism of Biomolecules. Major Intra and Extracellular electrolytes- Role of major physiological cations and anions- Electrolytes used in replacement therapy. (Elementry treatment only)

1.2 Physiological Acid- Base balance and Therapy, water, sodium, potassium and Hydrion metabolism.

1.3 Nutrition- composition of foods and balanced diet biological oxidations and bioenergetics.

1.4 Organic pharmaceutical aids- their role as preservatives, antioxidants, colouring, flavouring and sweetening agents, emulsifying agents, stabilizing and suspending agents, ointment bases.

Unit II

2. Drugs & Drug Design

2.1 Physiological aspects of Drugs, Organic medicinal substances of natural and synthetic origin.

2.2 Synthetic Drugs- Mode of action in the biological system- absorption, distribution biotransformation and excretion of drugs.

2.3 Drug design: Development of New drugs, procedures followed in drug design, concepts of lead compounds and lead modification, concepts of prodrugs and soft drugs, structure Activity relationship (SAR)

2.4 Concepts of drug receptors- Elementary treatment of drug receptor interactions. Physico- chemical parameters and surface activity parameters.

Unit III

3.1 Antineoplastic agents- Introduction, cancer chemotheraphy, special problems, role of alkylating agents and antimetabolites in treatment of cancer- recent development in chemotherapy. Radio isotopes in pharmacy.

3.2 Medicinally important compounds of Aluminium, phosphorous, arsenic and iron

3.3 Antiseptic and disinfectants.

Unit IV

4.1 Cardiovascular drugs- Cardiovascular diseases- drug inhibitors, synthesis of amylnitrate, sorbitrate, quinidine, atenolol, oxyprenolol.

4.2 Analgesics- Narcotic analgesics, morphine and derivatives, totally synthetic analgesics- salicylic acid derivalives.Indolyl derivatives and p.aminophenol derivatives.

Unit V

5.1 **Anaesthetics**- General and local- gaseous anaesthetics- Ether, Vinylmethoxyfluorans.Halogenated hydrocarbons like chloroform, Haloethane, trichloro ethylene, Nitrous oxide.Intravenousanaesthetics, local anaesthetics- cocaine and its derivatives.

5.2 **Antibotics**- Cell wall biosynthesis, inhibitors, antibiotics inhibiting protein, synthesis of penicillin-G, Penicillin-V, ampicillin, amoxicillin and chloramphenicol

5.3 **Hormones**- Their chemistry and functions, Thyroid hormones and antithyroid drugs, antidotes in poisoning.

References:

1. Medicinal Chemistry , G.R. Chatwal, Himalaya Publishing House.
2. Text Book of Medical Biochemistryt, S.Ramakrishnan, K.G. Prasannan and R.Rajan, Orient longmann.
3. Phamaceutical chemistry Inorganic, G.R.Chatwal.
4. Text Book of Pharmaceutical chemistry, Bentley and Driver's.
5. Pharmacology and Pharmacotherapeutics, R.S.Satoskar, S.D.Bhandarkar, Popular prakashan Bombay.
6. Harper's Biochemistry, Robert K.Murray, Daryl K.Granner, Peter A Mays, Victor W Rodwell, McGraw-Hill.
7. Pharmaceutical Chemitry, Jayashree Gosh.

8. Pharmaceutical Chemitry, Lakshmi.
9. Medicinal Chemistry, AshutoshKar, New Age International Pvt. Ltd.

CO – PO Mapping :

Medicinal Chemistry **Code :22KP3CHELCH4:1**

CO	PO									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	3	3	1	3	2	2	3	3	2	3
2	3	3	1	3	2	2	3	3	2	3
3	3	3	3	3	3	3	3	3	2	3
4	3	3	3	3	2	3	3	3	2	3
5	3	3	1	3	3	3	3	3	3	3

1 – Low, 2 – Moderate, 3 – High correlation

21.3.2022

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SEM III	MBE 4:2	COMPUTER APPLICATIONS IN CHEMISTRY	22KP3CHELCH4:2	Ins.Hrs.-6	Credit: 4

CO	STATEMENT	
	After successful completion of the course, the students will be able to	
1	Learn about basic structure and functioning of computers,storaging devices,date processing and an introduction to WINDOWS,application software.	K1
2	Understand about the computer networks and its components, topologies of network and how to search the chemistry database using internet.	K2
3	Illustrate the structure of a C program and its data types and how to use control structure for Programming.	K4
4	Examine the functions,preprocessors structure,file handling of arrays and pointers.	K5
5	Analyse the applications of C- Programming using programming for chemistry related equations.	K6
K1-Remember; **K2**-Understand;**K3**-Apply; **K4**-Analyse; **K5**-Evaluate **K6**-Create		

UNIT I

Introduction

Basic structure and Funtioning of computers with a PC as an illustrative example-Introduction to computers and computing-hardware-basic organization of a computer – CPU-Main memory-secondary storage-I/O devices-Operating systems with DOS as an example.Introduction to UNIX and WINDOWS –Data processing-principles of programming-software system and application software-high and low level languages-compliers-Algorithms and Flowcharts.

UNIT II

NETWORKING

Introduction to networking-computer networks-network components-hubs,switches,repeaters,routers,bridges-browsers and gateways-network topologies – star,bus and ring-LAN,WAN,Intranet and Internet-World Wide Web-Internet for chemists-online search of chemistry database-search engines for chemistry-chem.web.

UNIT III

C-PPROGRAMMING I

a. C-Programming-structure of a c program-Data types,Variables,types,Variables,Constants,Keyboards,Operators,Expression.

b. Control structure-if,if-else,nested if-else,while,while-do,for nested for,goto,continue,break,switch case statements.

UNIT IV

C-PROGRAMMING II

a. Arrays-user defined function(recursion,call by value and call by reference)-String functions- Preprocessors-storages class-structure union

b. Pointers-PointerExpressions,Arithmetic passing pointers through arrays and functions-file handling,Introduction to OOPS.

UNIT V

a. C-programming-simple applications to chemistry-Determination/Calculation of

1) Average,RMS and Most Probable Velocities of gas molecules.
2) ΔE for atomic spectral transitions using Rydberg equation.
3) Energy of electromagnetic radiations(given wavelength o frequency)
4) Anharmonicity constant and dissociation energy of a molecule.
5) Enthalpy change using Clapeyron-Clausius equation.
6) Rate constant for a first order reaction.
7) –pH of a buffer solution (using Henderson's equation)
8) Solving systems of linear equations,usingGuass elimination method.
9) Least square fitting.

Reference

1. .Programming in C.E.Balagurusamy,Tata McGraw Hill.

2. Programming in ANSIC,E.Balagurusamy,Tata McGraw Hill.

3. "Let Us C",YashavantKanethkar,BPB Publications.

4. Computers in chemistry,K.V.Raman,Tata McGraw Hill.

5. Local Area Networks,S.K.Basandra,Galgotia Publication.

6. Computer Networks,A.S.Tanenbaum Prentice Hall of India.

7. Internet for chemists,S.M.Bachrach,ACSPublications,Washington DC.

8. Computer Networks,Protocols,Standards and Interfaces,UylessBlack,Prentice Hall of India.

CO – PO Mapping :

Computer Applications in Chemistry **Code : 22KP3CHELCH4:2**

CO	PO									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	1	2	2	3	3	3	3	3	3	3
2	1	2	2	3	3	3	3	3	3	3
3	3	3	2	3	3	3	3	3	3	3
4	3	3	2	3	3	3	3	3	3	3
5	3	3	3	3	1	3	3	3	3	3

1 – Low, 2 – Moderate, 3 – High correlation

21.3.2022

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SEM III	ECC 3	CHEMISTRY OF NANO SCIENCE AND NANOTECHNOLOGY	22KP3ECCCH3:1	Ins. Hrs. -	Credit: 3

CO	STATEMENT	
	After successful completion of the course, the students will be able to	
1	Introduce the nanomaterials and various properties of nanomaterials.	K1
2	Enable the students to understand the applications of nanomaterials and nanotechnology.	K2
3	Characterise the nanomaterials by various morphology techniques such as XPS,XIMS,TEM,SEM,STMAFM,SNOM,SICM and XRD.	K6
4	Illustrate the synthesis of nanoparticles by various methods.	K4
5	Acquire the knowledge in basic aspect of molecular biology,building up of nanostructures that incorporate biological molecules as components of system.	K2
K1-Remember; **K2**-Understand;**K3**-Apply; **K4**-Analyse; **K5**-Evaluate **K6**-Create		

UNIT-I

1. Introduction

1.1 Definition of Nanodimensional materials-Some historical milstone in the saga of nano forms- Size effects- Importance of nano materials- Classification of nanomaterials- Simple examples of unique properties of nano sized materials- elementary aspects of bio nano technology- Some important recent discoveries in nano science and technology.

1.2 Novel physical chemistry related to nanoparticles such as colloids and clusters: different equilibrium structures, quantum effects, conductivity and enhanced catalytic activity compared to the same materials in the macroscopic state.

UNIT-II

2. NanoMaterial

Nanotechnology Timeline and Milestones, Overview of different nanomaterials available, Potential uses of nanomaterials in electronics, robotics, computers, sensors in textiles, sports equipment, mobile electronic devices, vehicles and transportation. Medical applications of nanomaterials.Medical applications of nanomaterials.

UNIT-III

3. Techniques for Nano Material

Characterization Techniques Related to Nanoscience and Nanotechnology: Compositional surface analysis: XPS, SIMS, Contact angles. Microscopies: optical microscopy, fluorescence and confocal microscopy, TEM, SEM, Probe techniques: Scanning tunneling microscopy (STM), Atomic force microscopy (AFM), Scanning Nearfield Optical Microscopy SNOM, Scanning Ion Conducting Microscopy (SICM). Ellipsometry, Neutron Scattering and XRD, Spectroscopic Techniques: UV-visible and FT-IR.

UNIT-IV

4. Size and Synthesis of Nano Particles

4.1 Models of reaction of metal atoms in matrices, melting point,optical spectra, peculiarities of chemical processes on the surface of nano particles , Thermodynamics features of nano particles.

4.2 Chemical reduction reaction in micelles, Emulsions and Dendrimers, Photochemical and radiation chemical reduction ,Cryochemical synthesis ,physical methods, particles of various shapes and flims.

UNIT-V

5. Biochemistry Related to Nanoscience

Basic Aspects of Molecular Biology: Structure and function of proteins, antibodies, enzymes and implications for processing. Nucleic acids: DNA, RNA. Lipids: structure, role in membranes. The mammalian cell: Internal organization, specialized cells such as nerve cells. Building up of nano-structures that incorporate biological molecules as components of the system.

References:

1. C.N.R Rao, A.MullerA.K.Cheetam (Eds), The Chemitry of Nanomaterials, Vol.1, ao2, Wileg-VCH, Weinhein,2004.
2. Introduction to Nanotechnology**:** Charles P. Poole, Jr. and Frank J. Owens; Wiley Student Edition, 2008
3. Nanoscale Science and Technology, Robert W. Kelsall, Ian W. Hamley and Mark Geoghegan,John Wiley & Sons, Ltd., UK, 2005.
4. Introduction to Nanotechnology, Charles P. Poole Jr and Frank J. Owens, Wiley Interscience, 2003.
5. Bio-Inspired Nanomaterials and Nanotechnology, Edited by Yong Zhou, Nova Publishers.
6. Nano:The Essentials: Understanding Nanoscience and Nanotecnology,

T.Pradeep, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2008.
7. Nanostructures &Nanomaterials: Synthesis, Properties & Applications: G. Cao, Imperial College Press, 2004.
8. Nanomaterials and Nanochemistry, Br'echignac C., Houdy., and Lahmani M. (Eds)Springer Berlin Heidelberg New York. 2007.
10. Nanoparticle Technology Handbook. M. Hosokawa, K. Nogi, M. Naito and T. Yokoyama (Eds.) First edition 2007. Elsevier
11. Nanotechnology Basic Calculations for Engineers and Scientists. Louis Theodore,Johnwiley& sons, inc., publication, 2006.

CO – PO Mapping :

Chemistry of Nano Science and Nanotechnology Code : 22KP3ECCCH3:1

CO	PO									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	3	3	2	3	2	2	3	3	2	2
2	3	3	1	3	3	3	3	3	2	3
3	3	3	3	3	3	3	3	3	2	3
4	3	3	3	3	3	3	3	3	2	3
5	3	3	2	2	3	3	3	3	2	2

1 – Low, 2 – Moderate, 3 – High correlation

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CONTROLLER OF EXAMINATIONS
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SEM IV	CC 12	INORGANIC CHEMISTRY – II	22KP4CH12	Ins.Hrs.6	Credit:5

CO	STATEMENT	
	After successful completion of the course, the students will be able to	
1	Grasp the concept of Term symbols, Orgel diagram and Racah Parameters	K2
2	Learn the terms and concepts involved in inorganic photochemistry	K1
3	Explain the metal carbonyls, metallocenes and catalysis by organometallic compounds.	K5
4	Understand the concept of Bio-molecules and their role in metal ions	K2
5	Analysethe role of protein in oxygen and electron carriers	K4
K1-Remember; **K2**-Understand;**K3**-Apply; **K4**-Analyse; **K5**-Evaluate **K6**-Create		

Unit –I

1. Electronic spectroscopy:

Electronic configuration,terms,states and micro states,Derivation of term symbols(p2,d2)and arranging the various terms according to their energies.Spectroscopy terms-effect of inter electronic repulsion and spin-orbit coupling-Racah parameters A,B and C, RS coupling and j-j coupling.Selection rule-Group theoretical explanation.Splitting of orbitals in octahedral field-hole formalism Ground states of free ions for d^n systems-Oh and Td systems and the corresponding energy level diagrams-mixing of orbitals.Orgel diagram-characteristics-prediction and assignment of transition for d^n weak field cases.

UNIT II

2 Inorganic Photochemistry

2.1 Electronic transitions in metal complexes- metal-centred and charge-transfer transitions – various photo physical and photo chemical processes of co-ordination compounds.

2.2 Unimolecular charge-transfer- photochemistry of Cobalt (III) complexes-mechanism of CTTM photo reduction- Ligand Field photo chemistry of Chromium(III) complexes- Adamson's rules- photo active excited states, VC model.

2.3 Photochemistry of Ruthenium- poly pyridine complexes- relating to solar energy Conversion (solar cell) emission and redox properties- photo chemistry of

organometallic compounds- compounds with metal-metal bonding- Reinecke's Salt- Chemical actinometer.

UNIT III
Metal π complexes

3.1 Metal carbonyls: Structure and nature of bonding in metal carbonyls – vibrational spectra of metal carbonyls for structural elucidation-18 electron rule- Carbonylateions-carbonyl hydride complexes;
3.2 Metallocenes- preparation, reactions, nature of bonding and structure.
3.3 Catalysis by Organometallic compounds- Hydrogenation and Hydroformylation of Olefins, Olefins oxidation- Wacker Process- Olefin Polymerisation- Cyclooligomerization- Metathesis.

UNIT IV
Biomolecules and their role in Metal ion Storage and Transportation
4.1 Amino acids, Peptides and Proteins – Structure of Proteins, Lipids - lipid bilayer - biological membranes, chemistry of biologically relevant molecules like ADP, ATP, FAD, NADP, Nucleotides.
4.2 Biologically important metalions (NA, K, Mg, Ca, Cu, Fe, Zn, Co and Mo) and their functions, mechanism of transport of metal ion through biological fluids and membranes, different types passive and active transport process and their mechanism.Na^+/K^+pumb, Calcium pumb, and ionophores.

UNIT – V Role of Proteins as Oxygen and Electron Carriers
5.1 Chemistry of porphyrin, Iron porphyrins (Heme proteins) : Hemoglobin (Hb), Myoglobin (Mb) and their behaviour as oxygen carrier, O_2 affinity, cooperativity and Bohr's effect, Heme protein as electron carrier with particular reference to cytochrome – c and cytochrome – 450, and cytochrome oxidase. Non – heme oxygen uptake protein (hemerythrin and hemocyanin).
5.2 Magnesium porphyrins (chlorophyll) : Photosynthesis, the light and dark reaction (Calvin cycle). Non – heme iron-sulphur protein as electron carrier, rubredoxins and ferredoxins.

References

1. *The Organometallic Chemistry of the Transition Metals*, R.H. Crabtree, John Wiley
2. *Organometallic Chemistry*, R.C. Mehrotra and A .Singh, New Age International
3 . *Metallo-organic Chemistry*, A. J. Pearson, Wiley
4. *Inorganic Chemistry*, Keith F. Purcell, John C. Kotz, Holt-Saunders

5. *Inorganic Chemistry*, D.F. Shriver, P. W. Atkins, Oxford
6. *Bio Inorganic Chemistry*, I. Bertini, H. B. Gray, S. J. Lippard and J. S. Valentine, University Science Books.
7. *Physical Methods For Chemistry*, R. S. Drago, Saunders Company
8. *Structural Methods in Inorganic Chemistry*, E. A. V. Ebsword, D. W. H. Rankin and S. Cradock, ELBS
9. *Progress in Inorganic Chemistry Vol.,8, ed*, F. A. Cotton, Vol.,15, ed, S. J. Lippard, Wiley
10. *Basic Principles of Spectroscopy*, R. Chang, McGraw Hill
11. *Modern Spectroscopy*, J. M. Hollas, John Wiley
12. *Chemical applications of Group Theory*, F. A. Cotton, Wiley.
13. *Bio Inorganic Chemistry*,G.R.Chatwal&A.K.Bhagi, Himalayan Publishing House.
14. *Inorganic Chemistry- Principles of Structure and Reactivity*,J.E.Huheey, E.A.Keiter&R.L.Keiter, Addison- Wesley.
15. *Inorganic Photochemistry*,S.Arunachalam, Kala Publications, Tiruchirappalli
16. *Bio-inorganic Chemistry by Asim K Das.*
17. *Bio-inorganic Chemistry by E. Ochia.*

CO – PO Mapping :

Inorganic Chemistry – II **Code : 22KP4CH12**

CO	PO									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	3	3	2	3	3	2	3	3	2	3
2	3	3	3	3	3	3	3	3	3	3
3	3	3	3	3	2	3	3	3	2	3
4	3	2	2	3	2	3	3	3	2	2
5	3	2	2	3	2	3	3	3	2	2

1 – Low, 2 – Moderate, 3 – High correlation

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CONTROLLER OF EXAMINATIONS
01 AUG 2022

SEM IV	CC 13	PHYSICAL CHEMISTRY – II	22KP4CH13	Ins.Hrs.6	Credit:4

CO	STATEMENT	
	After successful completion of the course, the students will be able to	
1	Understand the theory, various reactions and factors influencing reaction rate in solutions involved in chemical kinetics.	K2
2	Obtain the knowledge in ARRT, Hammett, Taft equation and fast reaction study.	K1
3	Learn the applications of Quantum chemistry.	K3
4	Know the concept of classical statistics, partition function and different types of partition function.	K1
5	Acquire the advanced knowledge in Bose –Einstein, Fermi dirac statistics, applications and heat capacity of solids.	K4
K1-Remember; **K2**-Understand;**K3**-Apply; **K4**-Analyse; **K5**-Evaluate **K6**-Create		

UNIT I

Chemical Kinetics I

1.1 Kinetics of opposing, consecutive, parallel and simultaneous reactions- Theories of Reaction Rates. Simple Collision theory, Absolute Reaction Rate Theory (ARRT)- thermodynamic treatment of absolute reaction rate theory.

1.2 Theory of unimolecular reactions- Lindemann's theory, Hinshelwood theory.

1.3 Principles of microscopic reversibility- Steady State approximation- Chain reactions- thermal and photochemical reactions between hydrogen and halogens- Factors influencing reaction rates in solutions.

UNIT II

Chemical Kinetics II

2.1 Factors influencing reaction rates in solutions -Applications of Absolute Reaction Rate Theory to solution kinetics- Effect of solvents, ionic strength and pressure on reaction rates in solution- volume of activation- substituent effect- Hammet and Taft equations

2.2 **Fast Reactions:** Study of kinetics by stopped flow technique- relaxation methods- T and P jump methods, flash photolysis and magnetic resonance methods. Reactions between H_2 and X_2 – Gas phase auto oxidation, explosion and explosion limits.

UNIT III

3. Quantum Chemistry III

3.1 Exactly solvable nature of systems- approximation methods- variation method- linear variation principle-application to Hydrogen and Helium atoms perturbation method –first order - non degenerate systems- application of perturbation theory to Helium atom.

3.2 Hartree- Fockself consistent field method - Many electron atoms- wave functions- one electron orbitals- Pauli's principles and Slater determinants- Hartree-Fockself consistent field method- L-S and J-J coupling.

UNIT IV

4. Statistical Thermodynamics

4.1 Calculation of thermodynamic probability of system – difference between thermodynamic and statistical probability. Ensembles – phase space, ergodic hypothesis, definition of micro and macro states – different methods of counting micro and macro state for distinguishable and indistinguishable particles – Classical statistics - theory and derivation of Boltzmann distribution law.

4.2 **Partition Function:** Definition and calculation of partition function – translational, rotational, vibrational and electronic partition function.

UNIT V

5. Quantum Statistics

5.1 Bose- Einstein and Fermi Dirac statistics and their corresponding distribution functions- comparison with Boltzman statistics- application of Bose- Einstein statistics to photon- application of Fermi-Dirac statistics to electron gas- thermionic emission.

5.2 Heat capacity of solids- Einstein and Debye treatment. Concept of negative kelvin temperature.

5.3 Non – equilibrium thermodynamics: Thermodynamics of irreversible process. Entropy production and entropy flow in open system – onsagar's theory – phenomenological relations – onsagar reciprocal relation - Steady state condition – L12 = L21

References

1. *Introduction to Quantum Chemistry,*A.K.Chandra, Tata McGraw Hill
2. *Quantum Chemistry,*R.K.Prasad, Wiley Eastern Ltd.
3. *Molecular Quantum Mechanics,* P.W.Atkins, Clarenden.
4. *Chemical Kinetics,* K.J.laidler, Tata- McGraw Hill.
5. *Physical Chemistry,*P.W.Atkins, ELBS.
6. *Statistical Thermodynamics,* Lee Sears &Turcotte, Addison Wesley.
7. *Chemical thermodynamics,*T.M.Koltz, Benzamin.

8. *Thermodynamics for Chemists,*S.Glasstone, Affiliated East West Press.
9. *Statistical Thermodynamics,*W.Sears&L.Salinger, Narosa Publishing House.
10. *Thermodynamics for Students of Chemistry,*S.Rajaraman&J.C.Kuriacose, ShobhanLal- Nagin Chand.
11. *Principles of Quantum chemistry , Levine*

CO – PO Mapping :

Physical Chemistry-II **Code : 22KP4CH13**

CO	PO									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	3	3	2	3	2	3	3	3	2	2
2	3	3	2	3	2	3	3	3	2	2
3	3	3	3	3	3	3	3	3	2	2
4	3	3	2	3	2	3	3	3	2	2
5	3	3	2	3	2	3	3	3	2	2

1 – Low, 2 – Moderate, 3 – High correlation

21.3.2022

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CONTROLLER OF EXAMINATIONS
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SEM IV	CC 14(P)	PHYSICAL CHEMISTRY PRACTICAL II	22KP4CH14P	Ins.Hrs. 6	Credit: 4

CO	STATEMENT	
	After successful completion of the course, the students will be able to	
1	Discover the equivalent conductometric by DHO and Kohlrauch's law method and Dissociation constant by Ostwald's dilution method.	K3
2	Understand the concepts of various conductometric and potentiometric method.	K2
3	Evaluate the solubility product of AgCl by potentiometric and conductometric method.	K5
4	Determine the P^H of the buffer solutions.	K5
5	Analyse the strength of acids from its mixture by conductometric and potentiometric method.	K4
K1-Remember; **K2**-Understand;**K3**-Apply; **K4**-Analyse; **K5**-Evaluate **K6**-Create		

1. Verification of Onsagar's equation and determination of equivalent conductance at infinite dilution of strong electrolyte.
2. Verification of Ostwald's dilution law and determination of dissociation constant of weak acid.
3. Determination of equivalent conductance of a weak electrolyte by kohlrauch's law.
4. Determination of solubility product and solubility of silver chloride by conductance measurements.
5. Conductometric Titrations:mixture of acids Vs strong base
6. Conductometric Titrations:mixture of HCl and $CuSO_4$VsNaOH.
7. Conductometric Titrations: mixture of halide Vs $AgNO_3$
8. Conductometric Titrations:K_2SO_4,$MgSO_4$Vs $BaCl_2$
9. Determination of solubility and solubility product of silver chloride by Emf measurements.
   Determination of P^H of given buffer solution.
10. Estimation of ferrous ion using $K_2Cr_2O_7$
11. Estimation of ferrous ion using $KMnO_4$
12. Determination of dissociation constant of the organic acid using Quinhydrone electrode by potentiometry titration.
13. Potentiometric acid-base titration.
14. Determination of Hydrolysis constant of Aniline Hydrochloride.

CO – PO Mapping :

Physical Chemistry Practical-II **Code: 22KP4CH14P**

CO	PO									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	3	3	2	3	2	3	3	3	2	2
2	3	3	2	3	2	3	3	3	2	3
3	3	3	2	3	2	3	3	3	2	3
4	3	3	2	3	2	3	3	3	2	3
5	3	3	2	3	2	3	3	3	2	3

1 – Low, 2 – Moderate, 3 – High correlation

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SEM IV	MBE 3:1	POLYMER CHEMISTRY	22KP4CHELCH3:1	Ins.Hrs.-6	Credit: 4

CO	STATEMENT	
	After successful completion of the course, the students will be able to	
1	Explain the importance of polymers, classifications of polymers and mass and size properties of polymers.	K5
2	Categorise the kinetics and degree of polymerization.	K6
3	Analyse to test the polymers and illustrate the structure and physical properties of polymers.	K4
4	Know the concept of the chemical reactions of polymers and isolation process of polymers.	K1
5	Comprehend the types of natural polymers and synthetic polymers.	K2
K1-Remember; **K2**-Understand;**K3**-Apply; **K4**-Analyse; **K5**-Evaluate **K6**-Create		

UNIT – I

1. Basics, Classification and Molecular Mass Determination

1.1 Importance of polymers- Basic concepts – Monomers, Repeat Units- Linear, Branched and Network Polymers.

1.2 Classification of Polymers – Addition, Condensation, Radical Chain – Ionic and Coordination- and Co-polymerization – Polymerization in homogeneous and heterogeneous systems – Biopolymers.

1.3 Mass and Size of Polymers – Polydispersion- Average Molecules Weight- Number and Weight average Mol. Wt.- Methods of Molecular weight determination – Osmometry, viscosity and light scattering methods.

UNIT II

2. Kinetics and Degree of Polymerization

2.1 Kinetics of polymerization – Free radical chain polymerization, Cationic and Anionic polymerization.

2.2 Degree of Polymerization – Chain length, chain transfer, chain termination- Stereo regular polymerization – Olefin polymerization– Zeigler – Natta catalyst.

UNIT III

3. Characterization and Properties

3.1 Analysis of polymers – Degree of crystallinity – Thermal analysis (Differential

Scanning Calorimetry and Thermo gravimetric Analysis) of polymers.

3.2 Polymer Structure and Physical Properties – Crystalline Melting point – T_m – relation to structure – Glass Transition Temperature- T_g – Factors affecting T_g – Relationship between T_m and T_g.

UNIT IV

4. Chemical Reactions and Polymerization Process

4.1 Hydrolysis, acidolysis, hydrogenation, addition and substitution reactions – cyclization - cross-linking – vulcanization- graft and block co-polymers

4.2 Types of degradations- Thermal, Mechanical, Oxidative, Hydrolytic and Photo degradation

4.3 Plastics, Elastomers and Fibres – Processing Techniques: Calendering, die casting, film casting, injection molding, blow molding, foaming and fibre spinning.

UNIT V

5. Polymer Types

5.1 Natural Polymers- proteins, polysaccharides and rubber

5.2 Synthetic Polymers: synthetic rubber, polyesters, polytetrafluoroethylene (TEFLON), polyethylene, polyvinylchloride, polyacrylates, polyacrylonitrile, polystyrene, phenolic resins, epoxy resins, silicone polymers. Fire retarding polymers, Biomedical polymers - contact lens, dental polymers and artificial heart.

References

1. *Text Book of Polymer Science,*F.W.BillmeyerJr, John – Wiley & Sons.
2. *Polymer Science,* V. R. Gowariker, N. V. Viswanathan and J. Sreedhar, Wiley Eastern
3. *Polymer Chemistry- An Introduction,* Raymond B. Seymour, Marcel Dekker Inc., NY.
4. *Fundamentals of Polymer Science and Engineering,* K.Gupta, Tata McGraw Hill.
5. *Organic Polymer Chemistry,* K.J. Saunders, Chapman and Hall.
6. *Inorganic Polymers,* Stone, Academic Press, NY.
7. *Polymer Chemistry,* B.K.Sharma, Krishna PrakashanMandir, Meerut.
8. *Contemporary Polymer Chemistry,* H.R.Alcock and F.W Lambe, Prentice Hall
9. *Polymer Characterization of Processing Technology,* Stepak, Academic Press, London.

CO – PO Mapping :

Polymer Chemistry **Code : 22KP4CHELCH5:1**

CO	PO									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	3	3	2	3	2	3	3	3	2	2
2	3	3	2	3	2	3	3	3	2	2
3	3	3	3	3	2	3	3	3	2	3
4	3	3	2	3	2	3	3	3	2	3
5	3	3	3	3	2	3	3	3	2	3

1 – Low, 2 – Moderate, 3 – High correlation

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SEM IV	MBE 3:2	CHEMISTRY OF BIOMOLECULES	22KP4CHELCH3:2	Ins.Hrs.-6	Credit: 4

CO	STATEMENT	
	After successful completion of the course, the students will be able to	
1	Explain the classification biomolecules and infer the standard free energy change in biochemical reaction.	K6
2	Analyse the role of metals in biological process.	K4
3	Interpret the functions of bioorganic molecules.	K5
4	Demonstrate the hydrolysis of ATP,photosynthesis and respiratory chain.	K3
5	Compare the dialysis,gelfiltration,chromatography,electrophoresis and ultra centrification DNA fimger printing.	K2
K1-Remember; **K2**-Understand;**K3**-Apply; **K4**-Analyse; **K5**-Evaluate **K6**-Create		

UNIT I

BASIC PRINCIPLES

Classification of biometals-Essential,Trace and Ultra Trace Metals-Classes of Biomolecules and their Building Block Molecules.The first and second law of Thermodynamics-Standard Free Energy change in Biomolecules Reaction.

UNIT II

ROLE OF METALS IN BIOLOGICAL PROCESS

Na+/K+ pump and Ca2+ pump Transport and storage of Iron-Transferrin and Ferritin Metal ion toxicity and Detoxification by Chelation Metallotherapy-Metal deficiency and its therapy and limitation.

UNIT III

BIO ORGANIC MOLECULES

Heamoglobin as an oxygen carrier-sickle cell anemia.Enzymes and Co-enzymes-classification-Factor X Hemophilia Lipids-Role of LDL-Hypercholesterolemia .Nucleosides and Nucleotides-Nomenclature and Structure –Degradation of Pyridines –Lesch – Nyhan Syndrome.

UNIT IV

BIO ENERGIETIES

Hydrolysis of ATP –Mechanical work of Muscular Contraction-Active Transport Across Membranes-Mechanism of photosynthesis-Light reaction and Dark reaction.Election Transport System –Respiratory Chain.

UNIT V

BASIC TECHNIQUES USED BIO SEPARATION

Dialysis,Gelfiltration,Chromatography,Electrophoresis,Ultracentrification DNA and Fingerprinting.

Reference

1. .Biochemistry,LubertStryer,CBS Publishers and Distribuers.
2. .Principles of Biochemistry,Lehninger,CBS Publishers and Distributers.
3. .Metals in Biochemistry,P.M.Harrision and R.J.Hoarse,Chapman and Hoare,Chapam and Hall Ltd.
4. Bio inorganic Chemistry,A.K.Das,CBS Publishers and Distributers.
5. .Practical Biochemistry,David.T.Plummer,TataMegraw-Hill Publishers Ltd
6. .Essentials of Bio Organic Chemistry,R.W.Hanson,Edward Arnold Publishers Ltd
7. Bio Inorganic Chemistry,M.Satake and Y.Mido,Discovery Publishing House
8. Bio Inorganic Chemistry,G.R.Chatwal and A.K.Bhagi,Himalaya Publishing House

CO – PO Mapping :

Chemistry of Biomolecules **Code: 22KP4CHELCH5:2**

CO	PO									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	3	3	1	3	2	1	3	3	1	2
2	3	3	3	3	2	3	3	3	2	3
3	3	3	3	3	2	3	3	3	2	2
4	3	3	3	3	2	3	3	3	2	2
5	3	3	3	3	2	3	3	3	2	2

1 – Low, 2 – Moderate, 3 – High correlation

21.3.2022

CONTROLLER OF EXAMINATIONS 01 AUG 2022

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