

Sacred Heart College (Autonomous), Thevara

Department of Chemistry

BSc Chemistry

Semester 5

2018 - 19

COURSE STRUCTURE

COURSE CODE	TITLE OF THE COURSE	NO. HRS./ WEEK	CREDITS	TOTAL HRS./SEM
15U5RCHE05	INORGANIC CHEMISTRY I	3	3	54
15U5RCHE06	ORGANIC CHEMISTRY III	4	3	54
15U5RCHE07	PHYSICAL CHEMISTRY I	4	3	54
15U5RCHE08	PHYSICAL CHEMISTRY II	2	3	36
15U5RCHEOC	CHEMISTRY IN EVERYDAY LIFE	4	3	72

PROGRAMME	BACHELOR OF SCIENCE IN CHEMISTRY	SEMESTER	5
COURSE CODE AND TITLE	15U5RCHE05: INORGANIC CHEMISTRY I	CREDIT	3
HOURS/WEEK	3	HOURS/SEM	54
FACULTY NAME	DR. MIDHUN DOMINIC C D, DR. JUNE CYRIAC, DR. RAMAKRISHNAN S		

COURSE OBJECTIVES
To understand the general characteristics, physical and chemical properties of the d and f block elements
To know various theories of coordination compounds and isomerism exhibited by metal complexes
To understand the classification, properties and applications of organometallic compounds
To apply the concepts of acids and bases.
To analyse the importance and various functions of metals in biological systems

SESSION	TOPIC	LEARNING RESOURCES	VALUE ADDITIONS	REMARKS
MODULE I : Chemistry of d and f block elements (9h)				
1	Different properties of d block elements	Lecture	Q & A Session	
2	Electronic configuration, oxidation state.	PPT/Lecture		
3	Valency, metallic character, colour.	PPT/Lecture		
4	Magnetic properties, catalytic properties and ability to form complexes.	PPT/Lecture		
5	Comparison with second and third transition series.	Lecture		
6	Chemistry of Lanthanides	Lecture	Quiz	
7	Their properties	Lecture		
8	Lanthanide contraction, separation of lanthanides.	Lecture		
9	Actinides, properties. Comparison of lanthanides and actinides	Lecture		
MODULE II : Co-ordination Chemistry (18 h)				
10	Ligands, classification based on the number of donor atoms, chelating ligands, bridging ligands	Lecture		
11	Isomerism in complexes-Structural isomerism only, IUPAC nomenclature	Lecture		
12	Coordination number and possible geometries of complexes from C. N 3 to 12	PPT/Lecture	Quiz	
First Internal Examination				
13	Stereo isomerism- geometrical and optical	PPT/Lecture		

	isomerism of complexes with 4 and 6 coordination numbers.			
14	Stability of complexes - stepwise stability constant and overall stability constant, factors affecting the stability of metal complexes. EAN, Chelates and chelate effect.	Lecture	Quiz	
15	Magnetic behavior of complexes- Diamagnetic and paramagnetic complexes, explanation, effective magnetic moment, spins only magnetic moments, calculation of spin only magnetic moment. Quenching of magnetic moment.	Lecture		
16	Theories of bonding in coordination compounds- Werner's theory of coordination, primary and secondary valences of metal ions.	Lecture		
17	Valence bond theory- of octahedral, tetrahedral and square planar complexes, high spin and low spin complexes- inner and outer orbital complexes, explanation of magnetic properties	Lecture		
18	Limitations of valence bond theory.	Lecture		
19	Crystal field theory- splitting of d-orbitals in octahedral, tetrahedral complexes, strong and weak field ligands, pairing energy	PPT/Lecture		
20	Explanation of colour and magnetic properties of complexes, limitation of CF theory.	PPT/Lecture		
21	Jahn-Teller distortion and splitting of d orbitals in tetragonal and square planar fields	PPT/Lecture		
22	Jahn-Teller distortion in Cu (II) complexes. MO theory- evidence for metal ligand covalency	Lecture		
23	MOE diagram of complexes of octahedral symmetry (sigma bonding only).	Lecture		
24	Explanation of Δ in the Oh and Td complexes using MOE diagram.	Lecture	Quiz	
25	Substitution reactions in metal complexes- Labile and inert complexes, ligand substitution reactions in octahedral complexes	Lecture		
26	S_N1 and S_N2 substitution reactions. Substitution reactions of square planar complexes	PPT/Lecture		
27	Trans effect and applications of trans effect.	PPT/Lecture		
MODULE III : Organometallic Compounds (9h)				
28	Definition, Classification of organometallic compounds	Lecture		
29	Ylides, Classification on the basis of hapticity	Lecture		
30	Naming of organometallic compounds.	Lecture		
31	Catalytic properties, alkene hydrogenation,	Lecture	Quiz	

	shift reaction			
32	Zeigler-Natta polymerization, 18 e rule	Lecture	Q & Ans Session	
33	Metal-alkene complexes, metal-alkyne complexes	PPT/Lecture		
34	Metallocenes-Ferrocene. Zeise salt.	PPT/Lecture		
35	Preparation and structure.	PPT/Lecture		
36	Revision	PPT/Lecture		
MODULE IV : Acids and Bases (8h)				
37	Definition- Bronsted-Lowry, Lux-Flood, Solvent system, Usanovich and Lewis definitions. Self-study.	Lecture		
38	Strength of lewis acids and bases: Factors affecting strength of acids and bases: Solvent effect	Lecture		
39	Factors affecting strength of acids and bases: Leveling and differentiating solvents.	Lecture	Quiz	
40	Effect of substituent, steric factor, charge on the species, Electronegativity	PPT/Lecture		
41	Hydration, oxidation number of the central atom, resonance effect	PPT/Lecture		
42	Hard and Soft acids and bases. HSAB Theory, basis of HSAB theory	PPT/Lecture		
Second Internal Examination				
43	Symbiosis, Applications of HSAB Concept	Lecture		
44	Stability of complexes, mode of coordination, predicting feasibility of reactions	Lecture		
MODULE V : Bio-Inorganic Chemistry (10h)				
45	Essential and trace elements in biological systems, Myoglobin and Hemoglobin, role of myoglobin and hemoglobin in biological systems	PPT/Lecture		
46	Mechanism of oxygen transport, cooperativity, Bohr effect, Phosphate effect	PPT/Lecture	Video	
47	Cytochromes- Structure and function.	PPT/Lecture		
48	Metalloenzymes: Inhibition and poisoning of enzymes. A brief study of the following metalloenzymes and their functions. Carbonic anhydrase and Carbonic peptidase.	PPT/Lecture		
49	Cytochrome oxidase, cytochrome P450, Peroxidase, catalases, superoxide dismutase and Nitrogenase.			
50	Role of alkali and alkaline earth metals in biological systems, Na/K pump.	Lecture		
51	Metal deficiency: Deficiency of Iron, Copper and Zinc	Lecture		

52	Metal toxicity. Toxicity of Copper, Iron, Calcium, Plutonium, Mercury and Cadmium.	Lecture		
53	Metals as carcinogens. Treatment of metal toxicity. Chelation therapy.	Lecture		
54	Anti-cancer drugs – cisplatin and carboplatin.	PPT/Lecture		

INDIVIDUAL ASSIGNMENTS/SEMINAR – Details & Guidelines

	Date of completion	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)
1	02/08/2018	Properties of d-block elements
2	28/09/2018	Stability of complexes

GROUP ASSIGNMENTS/ACTIVITES – Details & Guidelines

	Date of completion	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)
1	05/10/2018	Oxygen transport mechanism

References

- J. D. Lee, Concise Inorganic Chemistry 5th edn., Wiley India Pvt. Ltd. 2008.
- R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry, 31st Milestone Publishers, New Delhi 2010
- G. L. Meissler, D.A Tarr, Inorganic Chemistry, 3rd Edn. Pearson Education, 2004.
- J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, Pearson 2006
- F. A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry 6th edn., John Wiley, New York 1991.
- M. Clyde Day, and J. Selbin Theoretical inorganic chemistry 2nd Edn. Reinhold Book Corp. 2008.
- B. Douglas, D. Mc Daniel, J. Alexander, Concepts and models of Inorganic Chemistry 3rd edn., John Wiley. 2006.
- Ivano Bertini, Harry B Gray, Stephen J. Lippard, Joan Selvertone Valentine, Bioinorganic Chemistry. Viva Books Pvt Ltd. 2007

PROGRAMME	B.Sc. Chemistry	SEMESTER	5
COURSE CODE AND TITLE	15U5CRCHE06 Organic Chemistry – III	CREDIT	3
HOURS/WEEK	4	HOURS/SEM	54
FACULTY NAMES	<i>Dr. Joseph T Moolayil, Dr. V.S . Sebastian, Dr. Franklin John, Dr. Grace Thomas</i>		

COURSE OBJECTIVES
<i>To explain the chemistry of organic compounds containing nitrogen.</i>
<i>To interpret the basics of organic photochemical reactions.</i>
<i>To explain the chemistry and applications of dyes, organic polymers, important aliphatic hydrocarbons, soaps, detergents and organic reagents of analytical and synthetic importance.</i>
<i>To explain the applications of chemotherapy.</i>
<i>To identify organic compound using UV, IR and PMR spectroscopic techniques.</i>

SESSION	TOPIC	LEARNING RESOURCES	VALUE ADDITIONS	REMARKS
MODULE I				
Organic compounds containing Nitrogen (20 hours)				
1	Introduction Nitro compounds- nitromethane-tautomerism reduction products of nitrobenzene in acidic, neutral and alkaline media-	Lecture	video	
2	reduction products of nitrobenzene in acidic, neutral	Lecture		
3	reduction products of nitrobenzene in alkaline media-	Lecture		
4	Electrolytic reduction and selective reduction of poly nitro compounds- formation of charge transfer complexes	Lecture	Assignment No: 1	
5	Amines- isomerism- stereochemistry of amines. Separation of a mixture of primary, secondary and tertiary amines-	Lecture		
6	Structural features affecting basicity of aliphatic and aromatic amines. Quaternary amine salts as phase-transfer catalysts	Lecture	Assignment No: 2	
7	Comparative study of aliphatic and aromatic amines.	Lecture		
8	Preparation of alkyl and arylamines (reduction of nitro compounds, nitriles),	Lecture		
9	Reductive amination of aldehydes and ketones	Lecture	Assignment No.3	

10	Gabriel-Phthalimide reaction, Hoffmann bromamide reaction.	Lecture		
11	Diazonium salts-preparation,	Lecture		
12	Synthetic transformations of aryldiazonium salts	Lecture		
13	Azo Coupling- Mechanisms of Sandmeyer's and Gatterman reactions	Lecture		
14	Schiemann and Gomberg reactions	Lecture		
15	Preparation and uses of Phenyl hydrazine	Lecture		
16	Diazomethane - preparation, structure and synthetic uses	Lecture	Demonstration	
17	Diazoacetic ester - preparation, structure and synthetic uses	Lecture		
18	Arndt-Eistert synthesis- mechanism	Lecture		
19	Wolff rearrangement –mechanism	Lecture		
20	Curtius rearrangement and its mechanism.	Lecture		

First Internal

MODULE II Dyes (5 hours)

21	Theory of colour and constitution. Classification - according to structure and method of application.	Lecture		
22	Preparation and uses of Azo dye-methyl orange and Bismark brown,	Lecture		
23	Preparation and uses of Triphenyl methane dye - Malachite green,	Lecture		
24	Preparation and uses of Phthalein dye - phenolphthalein and fluoescen,	Lecture	Quiz	
25	Preparation and uses of Vat dye – indigo	Lecture		
26	Preparation and uses of Anthraquinone dye - alizarin	Lecture		

Module III Photochemical Reactions(3 hours),

27	Introduction- Photochemical versus Thermal reactions.	PPT/Lecture		
28	Norrish reactions of acyclic Ketones.	PPT/Lecture		
29	Patterno-Buchi, Photo-Fries reactions.	PPT/Lecture		

Module IV Organic Polymers (4 hours)

30	Synthesis and applications of the following polymers- Polyesters- terephthalates,	PPT/Lecture		
31	Nylon 6 and Nylon 6,6, phenol formaldehyde resins, urea formaldehyde resins.	PPTLecture		
32	Epoxy resins and polyurethanes, PVC and Teflon.	Lecture		
33	Synthetic rubbers –SBR and Nitrile rubber- structure and applications	Lecture		

Module V Aliphatic hydrocarbons (2 hours)

34	Cycloalkanes- relative stabilities	Lecture		
35	Butadiene – structure and stability, 1,4 addition and its mechanism	PPT/Lecture		

MODULE VI, Soaps and Detergents (3 hrs)				
36	Synthetic detergents- - their functions – comparison between soaps and detergents-	PPT/Lecture		
37	Composition of soaps- detergent action of soap..	PPT/Lecture		
38	Environmental aspects. LAS and ABS detergents			
MODULE VI Chemotherapy (5)				
39	Drugs- introduction –classification –mode of action	PPT/Lecture		
40	Elementary idea of the structure and mode of action of drugs Sulphanilamides,	PPT/Lecture		
41	Elementary idea of the structure and mode of action of drugsAmphicillin and Chloramphenicol	PPT/Lecture		
42	Elementary idea of the structure and application of Chloroquine, Paracetamol, Analgin and Aspirin.	Lecture	Quiz	
43	Drugs in cancer therapy- Chlorambucil	Lecture	Q &Ans Session	
Second Internal				
MODULE VII Chemistry of Organic Reagents (4 hours)				
44	Analytical reagents – Tollens reagent, Fehling solution	PPT/Lecture		
45	Schiff's reagents, Borsche's reagent, Benedict solution	PPT/Lecture		
46	Applications of Synthetic reagents –NBS, Lead tetra acetate, Periodic acid, OsO ₄	PPT/Lecture		
47	Ozone, LDA, Raney Nickel, Selenium dioxide, DCC (elementary idea.	PPT/Lecture		
MODULE VIII Structure elucidation (8 hours)				
48	Introduction to UV and IR	Lecture		
49	Introduction to NMR spectroscopy	Lecture		
50	UV, IR and NMR spectral characteristics of ethylene, butadiene, benzene and acetaldehyde	PPT/Lecture	Quiz	
51	UV, IR and NMR spectral characteristics of acetoneacetophenone,crotonaldehyde,ethanol	PPT/Lecture		
52	Problems pertaining to the structure elucidation of simple organic compounds using IR and PMR spectroscopic techniques	PPT/Lecture		
53	Mass spectrometry- Introduction-EI ionisation- Determination Molecular mass by MS	PPT/Lecture		
54	Problem Solving	PPT/Lecture	Assignment	
55	Problem solving	PPT/Lecture		

INDIVIDUAL ASSIGNMENTS/SEMINAR – Details & Guidelines

	Date of completion	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)
1	02/10/2018	Spectroscopic problems
2	28/11/2018	Uses of Reagents

GROUP ASSIGNMENTS/ACTIVITIES – Details & Guidelines

	Date of completion	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)
1	05/11/2018	Chemotherapy (Group Discussion)

References

1. I. L. Finar, '*Organic Chemistry*', 6th Edition, Vol. I, Pearson.
2. R. T. Morrison and R. N. Boyd, '*Organic Chemistry*', 6th Edition - Prentice Hall of India.
3. M. K. Jain and S. C. Sharma '*Modern Organic Chemistry*', 3rd Edition, Vishal Publishing Company Co.
4. K. S. Tewari and N. K. Vishnoi, '*Organic Chemistry*', 3rd Edition, Vikas Publishing House
5. B. S. Bahl, '*Advanced Organic Chemistry*', S. Chand.
6. F. W. Billmeyer, '*Text Book of Polymer Science*', Jr. John Wiley and Sons, 1994.
7. V. R. Gowariker, N. V. Viswanathan and Jayadev Sreedhar, '*Polymer Science*', Wiley Eastern Ltd., New Delhi.
8. A. I. Vogel, '*A Text Book of Practical Organic Chemistry*', Longman.
9. F. G. Mann and B.C. Saunders, '*Practical Organic Chemistry*', 4th edn. Pearson Education.
10. N. K. Vishnoi, '*Advanced Practical Organic Chemistry*', Vikas Publishing House.

Further Reading

1. P. Y. Bruice, '*Organic Chemistry*', 3rd Edn. Pearson Education Asia.
2. John McMurry, '*Organic Chemistry*', 5th Edition -Thompson Asia Pvt. Ltd.
3. C. N. Pillai, '*Organic Chemistry*' Universities Press.
4. B. K. Sharma, '*Polymer Chemistry*', Goel Publishing House, Meerut, 1989.
5. J. March, '*Advanced Organic Chemistry*', IV Edn, John Wiley & Sons, NY.
6. W. Kemp, '*Organic Spectroscopy*', Longman, 1995.
7. D. L. Pavia, G. M. Lampman and G. S. Kriz, '*Introduction to Spectroscopy*', Thomson Brooks Cole.

PROGRAMME	BACHELOR OF CHEMISTRY	SEMESTER	5
COURSE CODE AND TITLE	15U5CRCHE07: Physical Chemistry I	CREDIT	3
HOURS/WEEK	4	HOURS/SEM	54
FACULTY NAME	Dr. K B Jose, Dr. Ignatious Abraham, Dr. Abi T.G.		

COURSE OBJECTIVES
To Describe the properties of solid, liquid and gaseous states and solutions
To apply the theories of symmetry and point groups to simple molecules.
To explain the theories and applications of adsorption.
To analyse and determine the molecular weights of solids using colligative properties

SESSION	TOPIC	LEARNING RESOURCES	VALUE ADDITIONS	REMARKS
MODULE I				
Unit I : GASEOUS STATE				
1	Kinetic molecular model of gases	Lecture	video	
2	Pressure of an ideal gas, derivation of gas laws	PPT/Lecture		
3	Maxwell's distribution of velocities – molecular velocities (average, root mean square and most probable velocities)	PPT/Lecture		
4	Collision diameter, mean free path	PPT/Lecture		
5	Viscosity of gases – temperature and pressure dependence. Relation between mean free path and coefficient of viscosity.	PPT/Lecture		
6	Barometric distribution law	PPT/Lecture		
7	Law of equipartition of energy	Lecture		
8	Degrees of freedom and molecular basis of heat capacities.	Lecture		
9	Real gases: compressibility factor z	Lecture		
10	Van der Waals equation of state – derivation and application in explaining real gas behaviour. Virial equation of state	Lecture		
11	Van der Waals equation expressed in virial form – calculation of Boyle temperature, Isotherms of real gases	PPT/Lecture		
12	Continuity of states. Critical phenomena, Liquefaction of gases	PPT/Lecture		
MODULE II				
Unit II : LIQUID STATE				
13	Liquid State - introduction	PPT/Lecture		
14	Intermolecular forces in liquids	Lecture		
15	Viscosity – Factors affecting viscosity, Viscometer	Lecture		

	method			
16	Surface tension and Determination of surface tension	Lecture		
17	Structure of liquids	Lecture		
18	Unusual behaviour of water	PPT/Lecture		
MODULE III				
Unit III : SYMMETRY				
19	Symmetry of molecules-symmetry elements and symmetry operations – centre of symmetry, plane of symmetry, proper and improper axes of symmetry,	PPT/Lecture		
20	Combination of symmetry elements, molecular point groups, Schoenflies symbol,	Lecture	Assignment	
21	Crystallographic point groups	Lecture		
MODULE IV				
Unit IV : SOLID STATE				
22	The nature of the solid state and anisotropy- the law of constancy of interfacial angles	Lecture		
23	Law of rational indices - Miller indices. Seven crystal systems and fourteen Bravais lattices.	PPT/Lecture		
24	X-ray diffraction, Bragg's law	PPT/Lecture		
25	Detailed study of simple, face centred and body centred cubic systems	PPT/Lecture		
26	Bragg's x-ray diffractometer method and Powder pattern method			
27	Analysis of powder diffraction patterns of NaCl and KCl	PPT/Lecture		
28	Density of cubic crystals, identification of cubic crystal from crystallographic data.	PPT/Lecture		
29	Close packing of spheres, ccp and hcp arrangements	PPT/Lecture		
30	Structure of ionic compounds of the type AX - NaCl	Lecture	Quiz	
31	Structure of ionic compounds of the type AX - CsCl, ZnS and AX ₂ - (CaF ₂ , Na ₂ O)	Lecture		
32	Defects in crystals – stoichiometric and non-stoichiometric defects and Extrinsic and intrinsic defects	PPT/Lecture		
33	Electrical conductivity, semiconductors, n-type, p-type and Superconductivity – an introduction	PPT/Lecture		
MODULE V				
Unit V : LIQUID CRYSTALS				
34	Classification of liquid crystals	Lecture		
35	Structure of nematic phases	PPT/Lecture		
36	Structure of cholesteric phases	PPT/Lecture	Assignment	
MODULE VI				
Unit VII : SURFACE CHEMISTRY				
37	Adsorption – types	PPT/Lecture		
38	Adsorption of gases by solids	PPT/Lecture		
39	Factors influencing adsorption	PPT/Lecture		
40	Freundlich adsorption isotherm	PPT/Lecture		

41	Langmuir adsorption isotherm	PPT/Lecture		
42	The BET theory and use of BET equation for the determination of surface area.	PPT/Lecture	Video	
MODULE VII				
Unit VII : SOLUTIONS				
43	Introduction - Binary liquid solutions and Raoult's law- ideal and non-ideal solutions			
44	G_{mix} , V_{mix} , and S_{mix} for ideal solutions and Vapour pressure-composition and boiling point-composition curves of ideal and non-ideal binary liquid solutions	Lecture		
45	Fractional distillation of binary liquid-liquid solutions and Distillation of immiscible liquids, partially miscible liquid-liquid systems.	PPT/Lecture		
46	Critical solution temperature (CST) – the lever rule and Introduction to ternary liquid solutions	PPT/Lecture		
47	Solubility of gases in liquids – Henry's law	PPT/Lecture		
48	Distribution of a solute between two solvents – Nernst distribution law	PPT/Lecture		
49	Colligative properties of dilute solutions – vapour pressure lowering and Boiling point elevation	PPT/Lecture		
50	Colligative properties of dilute solutions –freezing point depression (thermodynamic derivation).	PPT/Lecture		
51	Osmotic pressure –laws of osmotic pressure and Reverse osmosis – purification of sea water	Lecture	video	
52	Abnormal molecular masses – van't Hoff factor	Lecture		
53	Degree of association and degree of dissociation	Lecture		
54	Revision	Lecture		

INDIVIDUAL ASSIGNMENTS/SEMINAR – Details & Guidelines

	Date of completion	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)
1	12/7/2018	Explain the different symmetry elements and point groups and classify the simple molecules to different point groups
2	22/8/2018	Explain the applications of liquid crystals

References

- B. R. Puri, L. R. Sharma, M. S. Pathania, Elements of Physical chemistry, Vishal Pub. Co. Jalandhar,
- K. L. Kapoor, A Textbook of Physical chemistry, Volumes 1, Macmillan India Ltd
- P. Atkins and J Paula, The elements of Physical chemistry, 7th edn., Oxford University Press
- F. A. Alberty and R J Silby, Physical Chemistry, 3rd Edn, John Wiley
- McQuarrie, J. D. Simon, Physical Chemistry – A molecular Approach, Viva Books Pvt. Ltd

PROGRAMME	BACHELOR OF CHEMISTRY	SEMESTER	5
COURSE CODE AND TITLE	15U5CRCHE08 - Physical Chemistry - II	CREDIT	3
HOURS/WEEK	2	HOURS/SEM	36
FACULTY NAME	<i>Dr. Thommachan Xavier, Dr. Jinu George</i>		

<i>Course Objective</i>
<i>To Explain the basics of spectroscopy.</i>
<i>To Explain the fundamental principles of rotational, vibrational, Raman, electronic, NMR and mass spectroscopic techniques.</i>
<i>To compare the aspects of rotational and vibrational spectroscopy.</i>
<i>To discuss the first order spectra of simple organic molecules.</i>
<i>To describe the fundamentals of photochemistry and optical properties.</i>
<i>To understand the mechanism of photochemical reactions and its application in everyday life.</i>

SESSION	TOPIC	LEARNING RESOURCES	VALUE ADDITIONS	REMARKS
Unit – I: Introduction to spectroscopy				
1	Introduction to Operating System	Lecture	Quiz	
2	Various types of molecular spectroscopic techniques	Lecture		
Unit – 2: Rotational spectroscopy				
3	Rotational spectrum	Lecture		
4	Energy levels of a rigid rotator	PPT		
5	Selection rules in rotational spectroscopy	Lecture		
6	Determination of bond length and problems	Lecture		
Unit – 3: Vibrational spectroscopy				
7	Vibrational spectrum: the simple harmonic oscillator	Lecture		
8	Energy levels, force constant, selection rules	Lecture		
9	Anharmonic oscillator – pure vibrational spectra of diatomic molecules	Lecture		
10	Selection rules, fundamental frequencies, overtones, hot bands	Lecture		
11	Degrees of freedom for polyatomic molecules	Lecture		
12	Concept of group frequencies	PPT/Lecture	e-resource	
Unit – 4: Raman spectroscopy				
13	Raman spectrum: quantum theory of Raman Effect	Lecture		
14	Concept of polarizability	Lecture		
15	Qualitative treatment of pure rotational and pure	PPT		

	vibrational Raman spectra of diatomic molecules			
16	Selection rules, rule of mutual exclusion	Lecture		
CIA-1				
Unit – 5: Electronic spectroscopy				
17	Electronic spectrum: concept of potential energy curves for bonding and anti-bonding molecular orbitals	Lecture		
18	electronic transition	Lecture		
19	the Frank-Condon principle, dissociation energy	Lecture		
20	Polyatomic molecules – qualitative description of σ , π and n- molecular orbitals	PPT		
21	energy levels and the respective transitions in polyatomic molecules	PPT/Lecture		
Unit – 6: NMR Spectroscopy				
22	NMR spectroscopy: basic principles of NMR spectroscopy	Lecture		
23	Nuclear shielding and deshielding	PPT/Lecture		
24	Chemical shift and molecular structure	Lecture		
25	Spin-spin splitting and coupling constant	Lecture		
26	First order spectra	Lecture		
27	Interpretation of PMR spectra of simple organic molecules	Lecture		
Unit – 7: Mass Spectroscopy				
28	Mass spectrometry: Basic principle-ionization, fragmentation, separation of ions	Lecture		
29	Representation of the spectrum	PPT/Lecture		
30	Application in molecular mass determination.	Lecture		
CIA-II				
Unit – 8: Photochemistry				
31	Interaction of radiation with matter: Laws of photochemistry	PPT/Lecture		
32	Jablonsky diagram	PPT/Lecture		
33	Fluorescence, phosphorescence	Lecture		
34	Quantum yield, primary and secondary processes	Lecture		
35	Basic concepts of photosensitized reactions	Lecture		
36	Problems	Lecture	Quiz	

INDIVIDUAL ASSIGNMENTS/SEMINAR – Details & Guidelines

	Date of completion	Topic of Assignment & Nature of assignment (Individual – Written – Graded)
1	03/08/2018	Rotational, IR Spectroscopy problems
2	15/09/2018	NMR spectrum of common organic compounds

GROUP ACTIVITES – Details & Guidelines

	Date of completion	Topic of Assignment & Nature of assignment (Group – Written/Presentation – Non-graded)
1	05/10/2018	Interpretation of colour of various solutions

References

1. Mc Quarrie, J. D. Simon, Physical Chemistry – A molecular Approach, Viva Books Pvt. Ltd,
2. C. N. Banwell and E M Mc Cash, Fundamentals of molecular spectroscopy 4th edn, Tata McGraw Hill, Chapters 6, 7.
3. K. L. Kapoor, A Textbook of Physical chemistry, Volumes 4, Macmillan India Ltd Chapter 4
4. I. N. Levine, Physical Chemistry, Tata Mc Graw Hill, Chapter 21.
5. R. Puri, L. R. Sharma, M. S. Pathania, Elements of Physical chemistry, Vishal Pub. Co., Chapter 21.
6. K. J. Laidler, John H. Meiser, Physical Chemistry, 2nd edn, Chapter 14.
7. K. K. Sharma, L R Sharma, A text book of Physical Chemistry, Vikas Publishing house Chapter 24

PROGRAMME	BACHELOR OF CHEMISTRY	SEMESTER	5
COURSE CODE AND TITLE	15U5OCHE1 - Chemistry in Everyday life	CREDIT	3
HOURS/WEEK	4	HOURS/SEM	72
FACULTY NAME	Dr. Grace Thomas, Dr. Ramakrishnan S, Dr. Abi T G, Dr. Ammu Rosin Jose		

COURSE OBJECTIVES
To Know the importance of chemistry in everyday life.
To understand the chemistry of food additives and flavours and its effect on human health.
To understand the chemistry of soaps, synthetic detergents and their environmental effects.
To understand the chemistry of cosmetics and the effect on health.
To understand the chemistry of plastics, paper and dyes.
To understand the hazards of plastics and other synthetic materials on human health and environment and acquaint the methods for its reduction.
To understand the chemistry of and drugs; their action and possible side effects
To explain the application of chemistry in agriculture and need of green methods

SESSION	TOPIC	LEARNING RESOURCES	VALUE ADDITIONS	REMARKS
MODULE I				
1	Functional food additives	Chalk & Board		
2	Adulteration	Chalk & Board		
3	Food laws	Chalk & Board		
4	Food laws	Chalk & Board		
5	Food colours - permitted and non – permitted	Chalk & Board	ICT	
6	Food colours: Toxicology	Chalk & Board		
7	Flavours – natural and synthetic	Chalk & Board		
8	Flavours – Toxicology	Chalk & Board		
9	Other functional additives	Chalk & Board		
10	Soft drinks- formulation	Chalk &		

		Board		
11	Health drinks	Chalk & Board		
12	Revision	Chalk & Board		
MODULE II				
13	Soaps – Introduction	Chalk & Board		
14	Detergent action of soap	Chalk & Board	Video demo	
15	Toilet soap, bathing bars	Chalk & Board		
16	Washing soaps, liquid soap manufacture. Significance of acidity and alkalinity	Chalk & Board		
17	Additives, fillers and flavours	Chalk & Board		
18	Significance of acidity and alkalinity	Chalk & Board		
19	Revision	Chalk & Board		
MODULE III				
20	Detergents- Introduction	Chalk & Board		
21	Detergent action	Chalk & Board	Video	
22	types of detergents-cationic, anionic, amphiphilic detergents	Chalk & Board		
23	Common detergent chemicals	Chalk & Board		
24	Additives, excipients colours and flavours	Chalk & Board		
25	Revision	Chalk & Board		
26	Enzymes used in commercial detergents	Chalk & Board		
CIA I				
27	Environmental hazards	Chalk & Board		
28	Revision	Chalk & Board		
MODULE IV				
29	Cosmetics- Introduction	Chalk & Board		
30	Classification	Chalk & Board		
31	Bathing oils	Chalk & Board		

32	Toilet powder,	Chalk & Board		
33	Dental cosmetics	Chalk & Board		
34	Shaving cream	Chalk & Board		
35	Shampoo, hair dyes	Chalk & Board		
36	Face creams	Chalk & Board		
37	Skin products	Chalk & Board		
38	General formulation of each type	Chalk & Board	ICT	
39	Toxicology of cosmetics	Chalk & Board		
40	Revision	Chalk & Board		
MODULE V				
41	Plastics in everyday life	Chalk & Board		
41	Brief idea of polymerization	Chalk & Board		
43	Thermoplastic and thermosetting polymers	Chalk & Board		
44	Use of PET, HDPE, PVC, LDPE, PP, ABS	Chalk & Board		
45	Use of PET, HDPE, PVC, LDPE, PP, ABS	Chalk & Board		
46	Biodegradable plastics	Chalk & Board		
47	Environmental hazards of plastics	Chalk & Board		
48	News print paper, writing paper, paper boards, cardboards	Chalk & Board		
49	Organic materials, wood, cotton, jute and coir	Chalk & Board		
50	International recycling codes, and symbols for identification	Chalk & Board	ICT	
51	Natural and synthetic dyes (basic idea only)	Chalk & Board		
52	Recycling of plastics	Chalk & Board		
53	Revision	Chalk & Board		
54	Revision	Chalk & Board		

MODULE VI				
55	Chemotherapy	Chalk & Board	ICT	
56	Types of drugs- analgesics	Chalk & Board		
57	Types of drugs- antipyretics, antihistamines	Chalk & Board		
58	Types of drugs- antacids tranquilizers, sedatives	Chalk & Board		
59	Types of drugs: antibiotics	Chalk & Board		
60	Types of drugs- antifertility drugs.	Chalk & Board		
MODULE VII				
61	Fertilizers- natural, synthetic, mixed	Chalk & Board		
CIA II				
62	NPK fertilizers	Chalk & Board		
63	Excessive use of fertilizers and its impact on the environment	Chalk & Board		
64	Bio fertilizers. Plant growth hormones	Chalk & Board		
65	Pesticides- Classification-insecticides, herbicides, fungicides	Chalk & Board		
66	Excessive use of pesticides –environmental hazards	Chalk & Board		
67	Excessive use of pesticides –environmental hazards	Chalk & Board	Discussion	
68	Bio pesticides	Chalk & Board		
69	Antiseptics and Disinfectants	Chalk & Board		
70	Disinfectants-Oils - vegetable oils, mineral oil	Chalk & Board		
71	essential oil-Sugars, artificial sugars	Chalk & Board		
72	Revision	Chalk & Board		

INDIVIDUAL ASSIGNMENTS/SEMINAR – Details & Guidelines

	Date of completion	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)
1.	10/07/2018	Ingredients of any 2 cosmetics

GROUP ASSIGNMENTS/ACTIVITES – Details & Guidelines

	Date of completion	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)
1	18/8/2018	Excessive use of pesticides –environmental hazards. Case studies in short

Reference

1. P. Coultate, Food- The Chemistry of its components. Royal Society of Chemistry, London(Paper back)
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6. Brown, Insect control by chemicals
7. A. K. De, Environmental Chemistry, New age International Ltd.
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9. Tisdale, S.L., Nelson, W.L. and Beaton, J. D. Soil Fertility and Fertilizers, Macmillian Publishing Company, New York, 1990.
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12. Gowariker V.R., Viswanathan N.V. and Jayader Sreedhar, Polymer Science, Wiley Eastern Ltd., New Delhi.
13. I.I Singh, V.K Kapoor, Organic Pharmaceutical Chemistry