

B.Sc. CHEMISTRY (WITH ALLIED MATHEMATICS)

SEM	COURSE CODE	PART	COURSE	COURSE TITLE	INS. HRS/ WEEK	CREDIT	MARKS		TOTAL
							CIA	ESE	
I	20U1LT1/LA1/LF1 /LH1/LU1	I	Language – I		6	3	25	75	100
	20UCN1LE1	II	English - I		6	3	25	75	100
	20UCH1CC1	III	Core – I	Inorganic, Organic and Physical Chemistry-I	5	5	25	75	100
	20UCH1CC2P		Core – II	Volumetric and Photometric Estimation-Practical	3	2	20	80	100
	20UPH1AC1		Allied –I	Fundamentals of Physics	5	4	25	75	100
	20UPH1AC2P		Allied –II	Properties of Matter - Practical	3	2	20	80	100
	20UCN1AE1	IV	AEC-I	Value Education	2	2	100	-	100
TOTAL				30	21			700	
II	20U2LT2/LA2/LF2 /LH2/LU2	I	Language – II		6	3	25	75	100
	20UCN2LE2	II	English – II		6	3	25	75	100
	20UCH2CC3	III	Core – III	Inorganic, Organic and Physical Chemistry-II	6	5	25	75	100
	20UCH2CC4P		Core – IV	Industrial Chemistry-Practical	3	3	20	80	100
	20UPH2AC3		Allied – III	Essential of Physics	4	3	25	75	100
	20UPH2AC4P		Allied –IV	Optical, Thermal and Electricity - Practical	3	2	20	80	100
	20UCN2SE1	IV	Skill Enhancement Course - I @	Soft Skills Development	2	2	100	-	100
TOTAL				30	21			700	
III	20U3LT3/LA3/LF3 /LH3/LU3	I	Language– III		6	3	25	75	100
	20UCN3LE3	II	English – III		6	3	25	75	100
	20UCH3CC5	III	Core– V	Inorganic, Organic and Physical Chemistry-III	4	4	25	75	100
	20UCH3CC6P		Core– VI	Preparation of Domestic Products and their Quality Testing- Practical	3	2	20	80	100
	20UMA3AC5:3		Allied– V	Differential Calculus	4	3	25	75	100
	20UMA3AC6:3		Allied–VI	Algebra And Trigonometry	3	2	25	75	100
	20UCH3GE1A/B	IV	Generic Elective I #		2	2	-	100	100
20UCN3AE2	AEC-II		Environmental Studies	2	2	100	-	100	
TOTAL				30	21			800	
IV	20U4LT4/LA4/LF4 /LH4/LU4	I	Language–IV		6	3	25	75	100
	20UCN4LE4	II	English– IV		6	3	25	75	100
	20UCH4CC7	III	Core– VII	Inorganic, Organic and Physical Chemistry-IV	5	5	25	75	100
	20UCH4CC8P		Core - VIII	Qualitative Analysis of Inorganic salts -Practical	3	2	20	80	100
	20UMA4AC7:3		Allied– VII	Ordinary and Partial Differential Equations	5	3	25	75	100
	20UMA4AC8:3		Allied–VIII	Statistics and Vector Calculus	3	2	25	75	100
	20UCH4GE2A/B	IV	Generic Elective – II #		2	2	-	100	100
20UCN4EA	V	Extension Activities	NCC, NSS, etc.	-	1	-	-	-	
TOTAL				30	21			700	
V	20UCH5CC9	III	Core – IX	Chemistry of p-Block Elements and Radioactive Nuclides	6	5	25	75	100
	20UCH5CC10		Core – X	Organic Compounds Containing O, N & S and Name Reactions	5	5	25	75	100
	20UCH5CC11		Core – XI	Energetics and Properties of Solutions	6	5	25	75	100
	20UCH5CC12P		Core - XII	PhysicalChemistryElectrical–Practical	4	4	20	80	100
	20UCH5DE1AP/BP	IV	Discipline Specific Elective – I **		5	4	20	80	100
	20UCH5SE2A/B		Skill Enhancement Course II @		2	2	-	100	100
	20UCH5SE3A/B		Skill Enhancement Course – III @		2	2	-	100	100
20UCH5EC1		Extra Credit Course - I	General Intelligence for Competitive Examinations	-	4*	--	100*	100*	
TOTAL				30	27			700	
VI	20UCH6CC13	III	Core– XIII	Chemistry of d, f- Block Elements and Metal Complexes	5	5	25	75	100
	20UCH6CC14		Core– XIV	Stereochemistry, Molecular Rearrangements and Natural Products	5	5	25	75	100
	20UCH6CC15		Core - XV	Electrochemistry, Molecular Spectroscopy and Group Theory	5	5	25	75	100
	20UCH6CC16P		Core - XVI	Gravimetric Estimation and Spectrophotometric Study of Metal Complexes– Practical	5	5	20	80	100
	20UCH6DE2A/B	IV	Discipline Specific Elective-II **		5	4	25	75	100
	20UCH6DE3AP/BP		Discipline Specific Elective-III **		4	4	20	80	100
	20UCN6AE3		AEC-III	Gender Studies	1	1	100	-	100
20UCH6EC2		Extra Credit Course - II	Chemistry for Competitive Examinations	-	4*	--	100*	100*	
	20UCHAECA		Extra Credit Course for all	Online Course	-	1*	-	-	-
TOTAL				30	29			700	
GRAND TOTAL				180	140			4300	

* Not Considered for Grand Total and CGPA.

B.Sc. CHEMISTRY (WITH ALLIED BOTANY)

SEM	COURSE CODE	PART	COURSE	COURSE TITLE	INS. HRS/ WEEK	CREDIT	MARKS		TOTAL
							CIA	ESE	
I	20U1LT1/LA1/LF1/LH1/LU1	I	Language – I		6	3	25	75	100
	20UCN1LE1	II	English - I		6	3	25	75	100
	20UCH1CC1	III	Core – I	Inorganic, Organic and Physical Chemistry-I	5	5	25	75	100
	20UCH1CC2P		Core – II	Volumetric and Photometric Estimation – Practical	3	2	20	80	100
	20UPH1AC1		Allied –I	Fundamentals of Physics	5	4	25	75	100
	20UPH1AC2P		Allied –II	Properties of Matter - Practical	3	2	20	80	100
	20UCN1AE1	IV	AEC-I	Value Education	2	2	100	-	100
TOTAL					30	21			700
II	20U2LT2/LA2/LF2/LH2/LU2	I	Language – II		6	3	25	75	100
	20UCN2LE2	II	English – II		6	3	25	75	100
	20UCH2CC3	III	Core – III	Inorganic, Organic and Physical Chemistry-II	6	5	25	75	100
	20UCH2CC4P		Core – IV	Industrial Chemistry – Practical	3	3	20	80	100
	20UPH2AC3		Allied – III	Essential of Physics	4	3	25	75	100
	20UPH2AC4P		Allied –IV	Optical, Thermal And Electricity - Practical	3	2	20	80	100
	20UCN2SE1	IV	Skill Enhancement Course - I @	Soft Skills Development	2	2	100	-	100
	TOTAL					30	21		
III	20U3LT3/LA3/LF3/LH3/LU3	I	Language– III		6	3	25	75	100
	20UCN3LE3	II	English – III		6	3	25	75	100
	20UCH3CC5	III	Core– V	Inorganic, Organic and Physical Chemistry-III	4	4	25	75	100
	20UCH3CC6P		Core– VI	Preparation of Domestic Products and their Quality Testing – Practical	3	2	20	80	100
	20UBO3AC5		Allied– V	Applied Botany I	4	3	25	75	100
	20UBO3AC6P		Allied–VI	Laboratory Course for Applied Botany I	3	2	20	80	100
	20UCH3GE1A/B	IV	Generic Elective I #		2	2	-	100	100
	20UCN3AE2		AEC-II	Environmental Studies	2	2	100	-	100
TOTAL					30	21			800
IV	20U4LT4/LA4/LF4/LH4/LU4	I	Language–IV		6	3	25	75	100
	20UCN4LE4	II	English– IV		6	3	25	75	100
	20UCH4CC7	III	Core– VII	Inorganic, Organic and Physical Chemistry-IV	5	5	25	75	100
	20UCH4CC8P		Core - VIII	Qualitative Analysis of Inorganic Salts - Practical	3	2	20	80	100
	20UBO4AC7		Allied– VII	Applied Botany II	5	3	25	75	100
	20UBO4AC8P		Allied–VIII	Laboratory Course For Applied Botany II	3	2	20	80	100
	20UCH4GE2A/B	IV	Generic Elective – II #		2	2	-	100	100
	20UCN4EA	V	Extension Activities	NCC, NSS, Etc.	-	1	-	-	-
TOTAL					30	21			700
V	20UCH5CC9	III	Core – IX	Chemistry of p-Block Elements and Radioactive Nuclides	6	5	25	75	100
	20UCH5CC10		Core – X	Organic Compounds Containing O, N & S and Name Reactions	5	5	25	75	100
	20UCH5CC11		Core – XI	Energetics and Properties of Solutions	6	5	25	75	100
	20UCH5CC12P		Core - XII	Physical ChemistryElectrical–Practical	4	4	20	80	100
	20UCH5DE1AP/BP	IV	Discipline Specific Elective – I**		5	4	20	80	100
	20UCH5SE2A/B		Skill Enhancement Course II@		2	2	-	100	100
	20UCH5SE3A/B		Skill Enhancement Course –III @		2	2	-	100	100
	20UCH5EC1		Extra Credit Course - I	General Intelligence for Competitive Examinations	-	4*	--	100*	100*
TOTAL					30	27			700
VI	20UCH6CC13	III	Core– XIII	Chemistry of d, f- Block Elements and Metal Complexes	5	5	25	75	100
	20UCH6CC14		Core– XIV	Stereochemistry, Molecular Rearrangements and Natural Products	5	5	25	75	100
	20UCH6CC15		Core - XV	Electrochemistry, Molecular Spectroscopy and Group Theory	5	5	25	75	100
	20UCH6CC16P		Core - XVI	Gravimetric Estimation and Spectrophotometric Study of Metal Complexes - Practical	5	5	20	80	100
	20UCH6DE2A/B		Discipline Specific Elective-II **		5	4	25	75	100
	20UCH6DE3AP/BP		Discipline Specific Elective-III **		4	4	20	80	100
	20UCN6AE3	IV	AEC-III	Gender Studies	1	1	100	-	100
	20UCH6EC2		Extra Credit Course - II	Chemistry for Competitive Examinations	-	4*	--	100*	100*
	20UCHAECA		Extra Credit Course for all	Online Course	-	1*	-	-	-
TOTAL					30	29			700
GRAND TOTAL					180	140			4300

* Not Considered for Grand Total and CGPA.

GENERIC ELECTIVE FOR OTHER MAJOR DEPARTMENT

SEM	COURSE CODE	COURSE TITLE
III	20UCH3GE1A	Chemistry in Daily Life
	20UCH3GE1B	Agricultural Chemistry
IV	20UCH4GE2A	Food and Nutrition
	20UCH4GE2B	Nanoscience and its Applications

@ SKILL ENHANCEMENT COURSES

SEM	COURSE CODE	COURSE TITLE
V	20UCH5SE2A	Analytical Techniques
	20UCH5SE2B	Electro analytical Techniques
	20UCH5SE3A	Clinical Chemistry
	20UCH5SE3B	Water quality analysis

**** DISCIPLINE SPECIFIC ELECTIVE**

SEM	COURSE CODE	COURSE TITLE
V	20UCH5DE1AP	Preparation and Analysis of Organic Compounds – Practical (20+80=100Marks)
	20UCH5DE1BP	Quantitative analysis by Photometric method – Practical (20 + 80 = 100 Marks)
VI	20UCH6DE2A	Essential Molecules for Life
	20UCH6DE2B	Essentials of Bioinorganic Chemistry
	20UCH6DE3AP	Physical Chemistry Non Electrical – Practical (20+80=100Marks)
	20UCH6DE3BP	Advanced Physical Chemistry - Practical (20+80=100Marks)

ALLIED CHEMISTRY FOR B.Sc. (PHYSICS)

SEM	COURSE CODE	COURSE TITLE
I	20UCH1AC1:1	Inorganic, Organic and Physical Chemistry – I
	20UCH1AC2P	Volumetric Estimations -Practical (20 + 80 = 100 Marks)
II	20UCH2AC3:1	Inorganic, Organic and Physical Chemistry – II
	20UCH2AC4P	Organic Analysis – Practical (20 + 80 = 100 Marks)

ALLIED CHEMISTRY FOR B.Sc. (BOTANY & ZOOLOGY)

SEM	COURSE CODE	COURSE TITLE
I	20UCH1AC1:2	Inorganic, Organic and Physical Chemistry – I
	20UCH1AC2P	Volumetric Estimations - Practical (20 + 80 = 100 Marks)
II	20UCH2AC3:2	Inorganic, Organic and Physical Chemistry – II
	20UCH2AC4P	Organic Analysis – Practical (20 + 80 = 100 Marks)

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
I	20UCH1CC1	Core – I	INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY-I	5	5	100	25	75

Course Outcomes (COs):

At the end of the course, students will be able to

CO1: Locate the destiny of an electron and categories the trend of periodic properties.

CO2: Identify inorganic samples applying the principles of ionic equilibria and state the theories of indicators

CO3: Apply the IUPAC rules for naming the organic compounds and construct the structure of the organic molecules.

CO4: Report the mechanistic pathway of an organic reaction

CO5: Validate the characteristics of ideal and real gases.

UNIT – I

15 hours

ATOMIC STRUCTURE AND PERIODIC PROPERTIES

1.1 Structure of atom: Quantum numbers, Rules for filling the orbitals with electrons – Pauli's exclusion principle, Hund's rule, Aufbau Principle. Stability of completely and half-filled subshells; degeneracy of orbitals. #Periodic Table - Long form of periodic table#, Classification of elements on the basis of valence shell configuration.

1.2 Periodic properties: Ionization energy – Periodic variation, factors influencing ionization energy, Applications of the concept of ionization energy - metallic to non-metallic character along a period, relative reactivity, reducing power and basic character of elements. Electron affinity -periodic variation. Electronegativity – Periodic variation, Mullikan's scale, its calculation.

1.3. Properties of Elements: Atomic and ionic radii – Comparison, covalent, metallic and van der Waals radii, Ionic radii – determination of the radii of Na⁺ and F⁻ in NaF crystal by Pauling's method – Factors influencing magnitude of ionic radii – Periodic variations of atomic and ionic radii – Size variations of ions of same element with different oxidation states.

UNIT – II

15 hours

QUALITATIVE AND QUANTITATIVE ANALYSIS

2.1. Qualitative Analysis: Solubility, solubility product and common ion effect – Definition, applications in semi-micro qualitative analysis. Identification of anions: Nitrate - Brown ring test; Chloride - chromyl chloride test; Borate - ethyl borate test; Phosphate, arsenate - ammonium molybdate test; Carbonate, sulphate, chromate – reaction with HCl. #Interfering anions – elimination of fluoride, oxalate, borate and phosphate.# Cations: Group separation, identification of cations - Lead, copper, manganese, nickel, cobalt, barium, calcium, magnesium and ammonium.

2.2. Volumetric Analysis: Primary and secondary standards, preparation of standard solutions – Normality, Molarity and percentage, equivalence point and end point. Types of titrations: acid-base, redox, precipitation, iodimetry, iodometry and complexometric (EDTA) titrations, theory of indicators, phenolphthalein, methyl orange and Eriochrome Black-T.

UNIT – III

15 hours

3.1. Nomenclature of Organic Compounds

Rules of IUPAC system of Nomenclature - General procedure for giving IUPAC names of alkanes, alkenes and alkynes with branched chains and functional groups (OH, COOH, CHO, C=O and Halogens) - Application of rules to the naming of organic compounds under the IUPAC System.

3.2. Structure of Organic Molecules

Orbital structure of atom - electron configuration, shapes and orientation of orbitals, bond length, bond angle and bond energy - Types of covalent bonds – sigma and pi bonds - Hybridization- sp^3 , sp^2 and sp hybridization of carbon - Lewis and Line - Bond structure- Formal charge - Electro negativity – Definition - Polar and non-polar molecules (H_2O , CO_2 , CCl_4) - Resonance Concept - Rules governing Resonance - Use of Arrows - Attractions between Molecules - Dipole-dipole interactions - Hydrogen bonding - Effects of hydrogen bonding.

UNIT – IV

15 hours

4.1. Organic Reaction Mechanisms

Definition, Factors influencing reaction - Inductive and Mesomeric effects (Resonance effect) - Homolytic and Heterolytic fissions - Reaction intermediates - Carbonium ions (carbocations), Carbanions, Carbon free radicals and Carbenes – Classification of reagents – electrophilic and nucleophilic - Types of organic reactions – substitution, addition, elimination, rearrangements, tautomerism and free radical (an example for each) – Saytzeff and Hoffman rules

4.2. Energy requirements of organic reactions – Energy of activation, transition state, intermediates using energy profile diagram.

UNIT – V

15 hours

GASEOUS STATE

5.1 [#]Gas Laws, Kinetic theory of gases, Kinetic equation of gases[#], Derivation of various gas laws from Kinetic gas equation. Molecular velocities – Root Mean Square velocity, Average Velocity and Mean Velocity (calculations). Boltzmann, Einstein, Maxwell's law of distribution of molecular velocities.

5.2 **Expansivity and compressibility**- Boyle temperature, Mean free path, Collision diameter, Collision number, Collision frequency. Heat capacity of gases- Determination of heat capacity ratio and Degree of freedom of gaseous molecules.

5.3 **Real gases and ideal gases**- Deviation of real gases from the ideal behavior, derivation of van der Waals equation for real gases, significance of van der Waals constants. Intermolecular forces - dipole-dipole, induced dipole-induced dipole. Critical phenomenon and Calculation of critical constants. (Simple problems using van der Waals equation)

_____ # self-study portion

TEXT BOOKS:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year	Units Covered
1.	B.R. Puri and L.R. Sharma	Principles of Inorganic Chemistry	55 th Edition	Shoban Lal Nagin Chand and Co., New Delhi	2020	I & II
2.	P. L. Soni	Text Book of Inorganic Chemistry	Revised Edition	S. Chand & Co., New Delhi	2017	I & II
3.	P. K. Mani and A.O. Thomas	Textbook For Practical Chemistry for B.Sc. Main Students	1 st Edition	Xavier press, Cannanore	2006	II
4.	P. L. Soni and H. M. Chawla	Text Book of Organic Chemistry	28 th Edition	Sulthan and Chand company, New Delhi.	1999	III
5.	B. R. Puri, L. R. Sharma and M. S. Pathania	Principles of Physical Chemistry	48 th Edition	Vishal Publications, Jalandhar	2019	IV & V

Books for Reference:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year	Units Covered
1	R. D Madan	Modern Inorganic Chemistry	2 nd Reprint	S. Chand & Co., New Delhi	1987	I
2	B. R. Puri, L.R. Sharma and K. C. Kalia	Principles of Inorganic Chemistry	New Paperback Edition	Vishal Publications, Jalandhar	2020	II
3	M. K. Jain	Organic Chemistry	12 th Edition	Sulthan and Chand Company, New Delhi.	2003	III
4.	Bahl and Arun Bahl	Advanced Organic Chemistry	19 th Edition	Sulthan and Chand Company, New Delhi.	2005	III
5.	R.L. Madan and G.D. Tuli	Simplified Course in Physical Chemistry	5 th Revised and Enlarged Edition	S. Chand & Co., New Delhi,	2009	IV & V

Web Reference: Unit: I - https://nptel.ac.in/content/syllabus_pdf/104101121.pdf

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Paper				Hours		Credits	
I	20UCH1CC1		INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY-I				5		5	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓		✓			✓			✓	
CO2	✓	✓	✓		✓	✓	✓	✓	✓	
CO3	✓	✓				✓		✓	✓	
CO4	✓	✓	✓		✓	✓		✓	✓	✓
CO5	✓	✓	✓	✓		✓		✓	✓	✓
Number of Matches= 33, Relationship : Moderate										

Prepared by:

1. Dr. M. Purushothaman
2. Dr. S. Mohamed Rabeek

Checked by: Dr. K. Riaz Ahamed

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
I	20UCH1CC2P	Core – II	VOLUMETRIC AND PHOTOMETRIC ESTIMATION - PRACTICAL	3	2	100	20	80

Course outcomes(COs):

At the end of the course, students will be able to

CO1: Apply the principle of volumetric technique.

CO2: Estimate the quantity of chemical substance to analyze in a solution.

CO3: Understand the principle of photo colorimetric method.

CO4: Convert the higher concentration to lower concentration of solution.

CO5: Apply the photometric method analyze the commercial food items and medicines.

List of practicals:

I. Volumetric Estimation

-35 marks

1. Estimation of oxalic acid by KMnO_4 using a standard oxalic acid solution.
2. Estimation of ferrous sulphate.
3. Estimation of Oxalic acid.
4. Estimation of $\text{K}_2\text{Cr}_2\text{O}_7$.
5. Estimation of Mg (II) by EDTA.

II. Spectrophotometric Estimation

-35 marks

1. Estimation of Aspirin in commercial samples.
2. Estimation of Trace chromium in food samples
3. Estimation of Iron content in food items [Vitamin Tablet, Flour and Tea samples]

III. Record

-10 marks

Scheme of valuation

I. Volumetric Estimation -35 marks

Procedure writing - 05 marks

1-2 % error - 30marks

2-3 % error - 25marks

3-4 % error - 20marks

>4% error - 15marks

II. Spectrophotometric Estimation-35 marks

Procedure writing - 05 marks

1-2 % error - 30marks

2-3 % error - 25marks

3-4 % error - 20marks

>4 % error - 10marks

Books for Reference:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year	Units Covered
1.	Venkateswaran V. Veerasamy R. Kulandaivelu A.R	Basic Principles of Practical Chemistry	2 nd Edition	S. Chand & Co Pvt. Ltd, New Delhi	1997	All

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Paper			Hours		Credits		
I	20UCH1CC2P		PRACTICAL - I VOLUMETRIC AND PHOTOMETRIC ESTIMATION			3		2		
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓		✓	✓	✓		
CO2	✓	✓	✓		✓	✓	✓			
CO3	✓	✓	✓	✓		✓	✓			
CO4	✓	✓			✓	✓	✓		✓	✓
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Number of Matches = 35, Relationship : High										

Prepared by:

1. Dr. S. K. PERIYASAMY
2. Dr. S. S. SYED ABUTHAHIR

Checked by:

Dr. A. ZAHIR HUSSAIN

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
I	20UCH1AC1:1	Allied – I	INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY - I	5	4	100	25	75

(For B.Sc. Physics)

Course Outcomes (COs):

At the end of the course, students will be able to

CO1: Discuss the periodic properties, Construct the MO diagrams and infer the industrial products.

CO2: Classify the carbohydrates, amino acids, proteins and appraise their applications.

CO3: Categorize the polymers and to explain stereoisomerism.

CO4: Describe the chromatographic techniques and understand the photochemical laws.

CO5: Explain the concepts of conductance, corrosion and pH of solutions.

UNIT – I

15 hours

PERIODIC PROPERTIES, MOLECULAR ORBITAL THEORY AND INDUSTRIAL CHEMISTRY

- 1.1. **Periodic properties**- Ionization potential, electron affinity and electro negativity- Definition, factors affecting and variation in the periodic table.
- 1.2. **Molecular Orbital Theory**: LCAO, Bonding, anti-bonding orbital and bond order. MO diagrams of H₂, He₂, N₂, O₂ and F₂ molecules.
- 1.3. **Industrial Chemistry**: Fuel gases – Water gas, Producer gas, LPG, Gobar gas and Natural gas. Fertilizers – NPK and mixed fertilizers. Soap and detergents – An elementary idea of soap and detergent, Cleansing action of soap and detergents[#].

UNIT – II

15 hours

CARBOHYDRATES, PROTEINS AND NUCLEIC ACIDS

- 2.1. **Carbohydrates**: Classification. Glucose and fructose – Preparation and properties. Sucrose – Manufacture and properties. Starch and cellulose – Structure and uses.
- 2.2. **Amino Acids and Proteins**: Amino acids – Definition, classification, preparation and Properties of glycine - Peptides (Elementary treatment) – Proteins – Classification based on physical properties and biological functions.
- 2.3. **Nucleic acids**: DNA and RNA – functions - #Structure of DNA#.

UNIT – III

15 hours

POLYMERS, HETEROCYCLIC COMPOUNDS AND STEREOISOMERISM

- 3.1. **Polymers** – Definition, classifications of polymers – Natural and synthetic polymers, Inorganic and organic polymers, Thermo and thermosetting plastics. Addition and condensation polymerization. Preparation, properties and uses of polyethylene, PVC, Teflon, polyester, nylon 6, 6, and Bakelite.
- 3.2. **Heterocyclic compounds** – Furan, thiophene, and pyridine – Preparation, properties and uses.
- 3.3. **Stereoisomerism**: Optical isomerism – lactic and tartaric acid, Racemic mixture and resolution, Geometrical isomerism – maleic and fumaric acid, methods of determining geometrical isomerism.

UNIT – IV**15 hours****CHROMATOGRAPHY, PHOTOCHEMISTRY AND PHASE RULE**

4.1 **Chromatography** – Definition, classification – principles, Technique and application of TLC.

4.2 **Photochemistry**: Differences between thermal and Photochemical reactions, photochemical laws – Grothus-Draper's law, Einstein's law of photo chemical equivalence, Quantum efficiency, Lambert's law, Beer's law – derivation.

4.3 **Phase Rule**: Phase, Component, Degree of freedom, Phase Rule – definition, one component system – Water system.

UNIT – V**15 hours****CONDUCTANCE, CORROSION, pH AND BUFFER**

5.1. **Conductance**: Ionic conductance, electrolytic conductance, specific and equivalent conductance – Determination, Effect of dilution on conductivities, Ostwald's dilution law and Kohlrausch's law, conductometric titrations- Principle, applications (Strong acid vs Strong base and Weak acid and Weak base) and advantages.

5.2. **Corrosion**: Definition, types, wet and dry corrosion and preventive of corrosion.

5.3. **pH and Buffer**:

#pH, buffer solution#, Henderson-Hasselbalch equation and its importance (no derivation)-Biological importance of pH and Buffer solutions in living system.

_____ # Self study

Text books:

S.No.	Author Name	Book Name	Edition	Publisher Detail	Year	Units Covered
1.	P. L. Soni	Text book of Inorganic Chemistry	Revised Edition	S. Chand & Co., New Delhi	2017	I
2.	P. L. Soni and H.M. Chawla	Text Book of Organic Chemistry	28 th Edition	S. Chand & Co., New Delhi	1999	II & III
3.	B.R. Puri, L.R. Sharma and M.S. Pathania,	Principles of Physical Chemistry	48 th Edition	Vishal Publications, Jalandhar	2019	IV & V

References:

S.No.	Author Name	Book Name	Edition	Publisher Detail	Year	Units Covered
1.	Puri B.R., Sharma L.R., Kalia K.K.	Principles of Inorganic Chemistry	23 rd	Shoban Lal, Nagin Chand & Co. New Delhi.	1993	I
2.	Bahl and Arun Bahl	Advanced Organic Chemistry	19 th Edition	S.Chand & Co., New Delhi	2005	II
3.	M. K. Jain	Organic Chemistry	12 th Edition	S. Chand & Co., New Delhi	2003	II & III
4.	R. L. Madan, G.D. Tuli	Simplified Course in Physical Chemistry	5 th Revised and Enlarged	S. Chand & Co., New Delhi	2009	IV & V

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Paper				Hours		Credits	
I	20UCH1AC1:1		INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY - I				5		4	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓		✓	✓	
CO2	✓	✓	✓			✓			✓	
CO3	✓	✓	✓	✓	✓		✓	✓		
CO4	✓				✓	✓		✓		✓
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Number of Matches = 34, Relationship : Moderate										

Prepared by:

1. Dr. R. ABDUL VAHITH
2. Dr. M. YASEEN MOWLANA

Checked by: Dr. A. ZAHIR HUSSAIN

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
I	20UCH1AC1:2	Allied – I	INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY - I	5	4	100	25	75

(For B.Sc. Botany and Zoology)

Course Outcomes (COs):

At the end of the course, students will be able to

CO1: Discuss the periodic properties, Construct the MO diagrams and infer the industrial products.

CO2: Classify the carbohydrates, amino acids, proteins and appraise their applications.

CO3: Categorize the polymers and to explain stereoisomerism.

CO4: Describe the chromatographic techniques and understand the photochemical laws.

CO5: Explain the concepts of conductance, corrosion and pH of solutions.

UNIT – I

15 hours

PERIODIC PROPERTIES, MOLECULAR ORBITAL THEORY AND INDUSTRIAL CHEMISTRY

1.1 **Periodic properties**- Ionization potential, electron affinity and electro negativity- Definition, factors affecting and variation in the periodic table.

1.2 **Molecular Orbital Theory**: LCAO, Bonding, anti-bonding orbital and bond order – application of MO theory to H₂, He₂, N₂, O₂ and F₂ molecules

1.3 **Industrial Chemistry**: Fuel gases – Water gas, Producer gas, LPG, Gobar gas and Natural gas. Fertilizers – NPK and mixed fertilizers. Soap and detergents – An elementary idea of soap and detergent, cleansing action of soap and detergents.

UNIT – II

15 hours

CARBOHYDRATES, PROTEINS AND NUCLEIC ACIDS

2.1 **Carbohydrates**: Classification, glucose and fructose – preparation, open chain structure and properties - sucrose –manufacture and properties – starch and cellulose – properties and uses.

2.2 **Amino Acids and Proteins**: Amino acids – classification, preparation and properties of glycine - peptides (Elementary treatment) – proteins –[#] classification based on physical properties and biological functions[#].

2.3 **Nucleic acids**: Types of nucleic acids, primary building blocks of nucleic acids (Chemical composition – DNA and RNA) primary structure of DNA and its double helix.

UNIT –III

15 hours

POLYMERS, HETEROCYCLIC COMPOUNDS AND STEREOISOMERISM

3.1.**Polymers** – Definition, Classifications of polymers, Polymerization - Addition and condensation, synthetic polymers- preparation, properties and uses of polyethylene, PVC, Teflon, nylon 6, 6 and polyester.

- 3.2 **Heterocyclic compounds** – Furan, thiophene, and pyridine – Preparation and properties.
- 3.3 **Stereoisomerism:** Optical isomerism – lactic and tartaric acid, Racemic mixture and resolution, Geometrical isomerism – maleic and fumaric acid, methods of determining geometrical isomerism.

UNIT – IV

15 hours

SEPARATION AND PURIFICATION TECHNIQUES AND PHOTOCHEMISTRY

- 4.1 **Separation Techniques:** Distillation-steam, fractional and azeotropic distillation, crystallization,– principles, working techniques and applications.
- 4.2 **Chromatography** – principles and applications of paper, thin layer and column chromatography.
- 4.3 **Photochemistry:** Differences between thermal and photochemical reactions, photochemical laws – Grothus-Draper's law, Einstein's law of photo chemical equivalence, Quantum efficiency, Lambert's law, Beer's law – derivation.

UNIT – V

15 hours

ACIDS, BASES AND CATALYSIS

- 5.1. **Acids-Bases:** Arrhenius, Lowry-Bronsted and Lewis concepts of acids and bases, pH, buffer solution, Henderson-Hasselbalch equation and its importance (no derivation) - Biological importance of pH and buffer solutions in living system- Determination of pH by colorimetric method.
- 5.2 **Catalysis:** Catalysis – Importance of catalysis. Types of catalysis - Homogeneous and heterogeneous catalysis, factors affecting catalysis. Definitions of catalytic promoter, catalytic inhibitor, catalytic poison. Theory of catalysis - Acid-base and enzyme catalysis.

#_____# Self study

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1.	P.L. Soni	Text book of Inorganic Chemistry	Revised Edition	S. Chand & Co., New Delhi	2017	I
2.	P.L. Soni and H.M. Chawla	Text Book of Organic Chemistry	28 th Edition	S. Chand & Co., New Delhi	1999	II & III
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3.	R. L. Madan, G.D. Tuli	Simplified Course in Physical Chemistry	5 th Revised and Enlarged	S.Chand & Co., New Delhi	2009	IV & V

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Paper			Hours		Credits		
I	20UCH1AC1:2		INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY - I			5		4		
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓		✓	✓	
CO2	✓	✓	✓			✓			✓	
CO3	✓	✓	✓	✓	✓		✓	✓		
CO4	✓				✓	✓		✓		✓
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Number of Matches = 34, Relationship : Moderate										

Prepared by:

1. Dr. R. ABDUL VAHITH
2. Dr. M. YASEEN MOWLANA

Checked by: Dr. A. ZAHIR HUSSAIN

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
I	20UCH1AC2P	Allied – II	VOLUMETRIC ESTIMATIONS - PRACTICAL	3	2	100	20	80

(For B.Sc. Physics, Botany and Zoology)

Course outcome (COs):

At the end of the course, students will be able to

CO1: Apply the principle of volumetric technique

CO2: Understand the concept of indicators and dilution.

CO3: Analyze the concentration of different solutions.

CO4: Investigate the quality of portability of water.

CO5: Estimate the quantity of chemical substance in a solution.

List of Practicals:

I. Volumetric Estimation Practicals

-70 marks

1. Estimation of Sodium Hydroxide (Na₂CO₃ X HCl X NaOH)
2. Estimation of Hydrochloric Acid (H₂C₂O₄ X NaOH X HCl)
3. Estimation of Oxalic Acid (FeSO₄ X KMnO₄ X H₂C₂O₄)
4. Estimation of Ferrous Sulphate (H₂C₂O₄ X KMnO₄ X FeSO₄)
5. Estimation of KMnO₄ (K₂Cr₂O₇ X FAS X KMnO₄)
6. Estimation of Zinc by EDTA (MgSO₄ X EDTA X ZnSO₄)
7. Estimation of Magnesium by EDTA (MgSO₄ X EDTA X MgSO₄)

II. Record

-10 marks

Scheme of valuation

- | | |
|-------------------|------------|
| Procedure Writing | - 10 marks |
| Experiment | - 60 marks |
| 1-2% | - 60 marks |
| 2-3% | - 50 marks |
| 3-4% | - 40 marks |
| >4% | - 25 marks |

Books for Reference:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year	Units Covered
1	Venkateswaran V. Veerasamy R. Kulandaivelu A.R	Basic principles of Practical Chemistry	2 nd Edition	S. Chand & Co Pvt. Ltd, New Delhi	1997	All

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Paper			Hours		Credits		
I	20UCH1AC2P		VOLUMETRIC ESTIMATIONS PRACTICAL			3		2		
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓		✓	✓			
CO2	✓	✓	✓	✓		✓	✓			
CO3	✓	✓	✓			✓	✓		✓	
CO4				✓	✓	✓	✓	✓	✓	✓
CO5	✓	✓			✓	✓	✓	✓	✓	
Number of Matches = 32, Relationship : Moderate										

Prepared by:

1. Dr. S. K. PERIYASAMY
2. Dr. S. S. SYED ABUTHAHIR

Checked by:

Dr. A. ZAHIR HUSSAIN

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
II	20UCH2CC3	Core – III	INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY - II	6	5	100	25	75

Course outcome (COs):

At the end of the course, students will be able to

CO1: Construct MO diagrams of diatomic molecules and predict the existence of the molecule.

CO2: Predict the hybridization and shapes of molecules.

CO3: Produce the saturated hydrocarbons.

CO4: Apply the concept and uses of liquids and colloids in the applied field.

CO5: Compare crystal types and its structural determinations.

UNIT – I

18 hours

CHEMICAL BONDING-I

1.1 Covalent Bond: Valence Bond concept – #types of overlapping of orbitals (ss, pp, sp)[#] – sigma, pi –bonds: Polarity of bonds – ion polarization – degree of ionic character; Significance of dipole moment of polar molecules – Fajan’s Rules – Applications.

1.2 Ionic Bond: Electronic theory of valency, Properties of ionic compounds – Variable Electrovalence, Inert Pair effect, Lattice energy – Born Haber cycle – application, factors affecting lattice energy – solubility and solvation energy.

1.3 Molecular Orbital Theory: LCAO method, Bonding and anti–bonding MO – order, Relationship between bond order, stability, bond length. Molecular Orbital diagrams of H₂, He₂, N₂, O₂, CO, HF and NO – Calculation of bond order and magnetism - Comparison of valence bond theory and molecular orbital theory

UNIT – II

18 hours

CHEMICAL BONDING-II

2.1. Shapes of Covalent Molecules: Hybridization – formula for prediction of hybridization, sp (BeF₂, CO₂), sp² (BF₃, NO₃⁻ ion), sp³ (NH₄⁺, H₂O, SO₄²⁻), sp³d (PCl₅) – Bond strength, energy and length. #Resonance - Canonical forms of CO₂, NO₂, CO₃²⁻ – Resonance energy, conditions. # VSEPR – Postulates, shapes of BeCl₂, BH₃, CH₄, PCl₅, SF₆, H₂O and NH₃.

2.2. Metallic Bond: Properties of metals based on Electron sea theory, valence bond theory and band theory

2.3. Hydrogen Bond: Nature, types, effects on physical and chemical properties. van der Waals attraction-Significance of Intermolecular electrostatic forces.

Unit- III

18 hours

3.1. Alkanes

Isomerism - Methods of preparation - Wurtz synthesis, Corey-House Alkane Synthesis and Kolbe's synthesis – Physical properties, Chemical Properties – Chlorination (free radical substitution), Nitration, Sulphonation, Oxidation, Pyrolysis (cracking). Properties of Methane and Ethane

3.2. Cycloalkanes (3-6 membered rings)

Nomenclature - Methods of Preparation - Dieckmann, Simmons-Smith reaction, Properties - Physical and Chemical - Substitution and Ring-Opening reaction - Stability of Cycloalkanes - Bayer's Strain Theory.

3.3. Petroleum

Composition, mining, Refining – Cracking - Synthetic Petrol - Octane Number, Cetane Number, Flash Point and fire point. Petrochemicals – Definition, Composition and uses of Compressed Natural Gas (CNG), Biodiesel, Liquefied Natural Gas (LNG) and Liquefied Petroleum Gas (LPG)

UNIT – IV

18 hours

LIQUIDS AND COLLOIDS

4.1 Liquids: Physical properties of liquids - Vapour pressure, Measurement of vapour pressure by isoteniscopic method, Heat of vaporization, Trouton's rule - Surface tension, Measurement of surface tension by Capillary-Rise Method, Variation of surface tension with temperature and pressure. Viscosity – Variation of viscosity with temperature and pressure. Reynolds number

4.2 Liquid crystals: definition, classification, theory of liquid crystals, molecular arrangements in various states of liquid crystals, physical properties of liquids, molar volume – parachor, atomic parachor, structural parachor and application of parachor in deciding structures.

4.3. Colloids: Definition, differences between true solution, colloidal solution and suspension, phases of colloidal solution-Electrical properties – Zeta potential, charge on colloidal particles, double layer and zeta potential. Electrophoresis and Electro osmosis, Brownian movement, Tyndall effect (definition and uses only) - protection of colloids – Gold number, stabilities of sols, medicinal applications of colloids. #Surfactants, Emulsion and Gels - definition, types and their uses#.

UNIT – V

18 hours

SOLID STATE AND ADSORPTION

5.1 Solid state: # Classification- crystalline and amorphous solids, isotropic and anisotropic solids, unit cell, space lattice#, Bravais lattice, seven crystal systems, Law of rational indices, Weiss indices and Miller indices. Crystal structure of NaCl and CsCl. Packing in crystals – hcp, ccp and bcc.

5.2 X- ray diffraction: Derivation of Bragg’s equation – Determination of crystal structure by Laue’s powder method – Determination of Avogadro’s number. (Simple problems from Bragg’s equation)

5.3. Adsorption on solids: Chemisorption and physisorption. Postulates and mathematical form of Freundlich, Langmuir and BET adsorption isotherms.

Text Books:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year	Units Covered
1.	P.L. Soni	Text book of Inorganic Chemistry	Revised Edition	S. Chand & Co., New Delhi	2017	I & II
2.	P.L. Soni and H.M. Chawla	Text Book of Organic Chemistry	28 th Edition	Sulthan and Chand company, New Delhi	1999	III
3.	B. S. Bahl, G.D. Tuli and Arun Bahl	Essentials of Physical Chemistry	28 th Edition	S.Chand & Co., New Delhi	2020	IV & V
4.	B. R. Puri, L.R. Sharma and M.S. Pathania	Principles of Physical Chemistry	48 th Edition	Vishal Publications, Jalandhar	2019	IV & V

Books for Reference:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year	Units Covered
1.	R. D. Madan	Modern Inorganic Chemistry	2 nd Reprint	S. Chand & Co., New Delhi	1987	I & II
2.	B. R. Puri, L. R. Sharma and K. C. Kalia	Principles of Inorganic Chemistry	New Paperback Edition	Vishal Publications, Jalandhar	2020	I & II
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4.	R. L. Madan and G.D. Tuli	Simplified Course in Physical Chemistry	25 th Revised and enlarged Edition	S.Chand & Co., New Delhi	2009	IV & V
5.	J. N. Gurtu and A. Gurtu	Advanced Physical Chemistry	4 th Edition	Pragathi Prakashan, Meerut	2017	IV & V

Web Reference: **Unit: I** <http://ncert.nic.in/textbook/textbook.htm?kech1=0-7>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Paper				Hours		Credits	
II	20UCH2CC3		INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY - II				6		5	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓			✓	✓	✓		
CO2	✓		✓			✓		✓		✓
CO3	✓		✓	✓	✓	✓		✓		
CO4	✓	✓	✓		✓	✓	✓	✓	✓	✓
CO5	✓		✓			✓	✓	✓		
Number of Matches = 32, Relationship : Moderate										

Prepared by:

1. Dr. M. Purushothaman
2. Dr. S. Mohamed Rabeek

Checked by: Dr. K. Riaz Ahamed

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
II	20UCH2CC4P	Core – IV	INDUSTRIAL CHEMISTRY - PRACTICAL	3	3	100	20	80

Course outcomes (COs):

At the end of the course, students will be able to

CO1: Analyze the purity of commercial samples.

CO2: Evaluate the total hardness of water.

CO3: Understand the availability of chemical constituents in various commercial products.

CO4: Plan, conduct the equipment's and interpret the experimental results.

CO5: Detect and estimate the ions present in hard water.

List of Practicals:

I. Industrial Chemistry Practicals

- 70 marks

1. Estimation of total hardness of water using EDTA
2. Determination of Iodine value of oil by Hanus method.
3. Determination of saponification value of an oil
4. Estimation of ascorbic acid (Vitamin – C)
5. Determination of percentage purity of washing soda
6. Estimation of available chlorine in bleaching powder
7. Determination of percentage of calcium in lime stone
8. Determination of acid value of an edible oil

II. Record

-10 marks

Scheme of valuation

Procedure Writing	- 10 marks
Experiment	- 60 marks
1-2%	- 60 marks
2-3%	- 50 marks
3-4%	- 40 marks
>4%	- 25 marks

Books for Reference:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year
1	Venkateswaran V. Veerasamy R. Kulandaivelu A.R	Basic principles of Practical Chemistry	2 nd Edition	S. Chand & Co Pvt. Ltd, New Delhi	1997

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Paper			Hours		Credits		
II	20UCH2CC4P		PRACTICAL - II INDUSTRIAL CHEMISTRY			3		2		
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓				✓	✓	✓		
CO2	✓	✓	✓	✓		✓	✓	✓		
CO3	✓	✓	✓	✓		✓	✓	✓		
CO4		✓			✓		✓			
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Number of Matches = 31, Relationship : Moderate										

Prepared by:

1. Dr. S. K. PERIYASAMY
2. Dr. S. S. SYED ABUTHAHIR

Checked by:

Dr. A. ZAHIR HUSSAIN

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
II	20UCH2AC3:1	Allied - III	INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY - II	4	3	100	25	75

(For B.Sc. Physics)

Course Outcome (COs):

At the end of the course, students will be able to

- CO1: Infer the bonding nature of inorganic compounds and to classify different types of conductors.
- CO2: Understand the concept of electron displacement effect and to apply Huckel's rule to identify the aromatic compounds.
- CO3: Describe the preparation and uses of pesticides and some common drugs.
- CO4: Classify different types of solids and colloids.
- CO5: Compare the rate and molecularity reaction and to explain the application of catalysts.

UNIT – I

12 hours

COORDINATION CHEMISTRY AND METALLIC BOND

1.1. Coordination Chemistry:

Nomenclature of mononuclear complexes – Types of ligands, Werner, Sidgwick and Pauling's Theory. Biologically important co-ordination compounds – Haemoglobin and Chlorophyll- structure and biological functions.

1.2. Metallic Bond:

Electron gas and Band Theories. Semiconductors – Intrinsic and Extrinsic, n and p-type super conductors.

UNIT – II

12 hours

ELECTRON DISPLACEMENT EFFECTS, AROMATICITY AND SUBSTITUTION REACTIONS

- 2.1. **Electron Displacement Effects**- Inductive effect – relative strengths of aliphatic acid and alkyl amines, resonance – condition for resonance, consequences of resonance, hyper conjugation and steric effect - definition and examples.
- 2.2. **Aromaticity** – Conditions – Huckel's rule - aromaticity of benzene, furan, thiophene, pyrrole and pyridine.
- 2.3. **Substitution reactions**- mechanism of nitration, halogenation, sulphonation, # Friedel Crafts alkylation and acylation of benzene#.

UNIT – III

12 hours

CHLORO COMPOUNDS, CHEMOTHERAPY AND NAME REACTIONS

- 3.1. **Chloro compounds**: Preparation and uses of dichloromethane, chloroform, carbon tetrachloride, freons, DDT and BHC.
- 3.2. **Chemotherapy**: Sulpha drugs-structure, preparation and uses of sulphapyridine, sulphathiazole and sulphadiazine, Antibiotics –Structure and uses of penicillin–G and #Chloromycetin#.

- 3.3. **Name reactions:** Benzoin, Perkin, Cannizzaro, Reimer-Tiemann and Kolbe's reactions.
(Mechanism not necessary)

UNIT – IV

12 hours

SOLID STATE AND COLLOIDS

- 4.1 **Solid State:** Types of solids- crystalline and amorphous, unit cell, simple, body centered and face centered cubes, symmetry elements, seven crystal systems, Bragg's equation, Weiss indices and Miller indices.
- 4.2. **Colloids:** Definition, differences between true solution, colloidal solution and suspension, principle, applications -Electrical properties – Electrophoresis and Electro osmosis (definition and uses only) - protection of colloids – Gold number- medicinal applications of colloids.
- 4.3. **Emulsion and Gels:** definition, types, preparation, properties and applications.

UNIT – V

12 hours

CHEMICAL KINETICS, CHEMICAL EQUILIBRIUM AND CATALYSIS

- 5.1 **Chemical Kinetics:** Order, rate, molecularity of the reaction and rate constant, determination of order of the reaction, activation energy, effect of temperature on reaction rate.
- 5.2 **Chemical Equilibrium:** Criteria of homogeneous and heterogeneous equilibria. Decomposition of HI and PCl_5
- 5.3 **Catalysis:** Catalysis – Importance of catalysis. Types of catalysis - Homogeneous and heterogeneous catalysis, factors affecting catalysis. Definitions of catalytic promoter, catalytic inhibitor, catalytic poison. Theory of catalysis - Acid-base catalysis.

_____ # Self study

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S.No.	Author Name	Book Name	Edition	Publisher Detail	Year	Units Covered
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References:

S.No.	Author Name	Book Name	Edition	Publisher Detail	Year	Units Covered
1.	B. R. Puri and L.R. Sharma	Principles of Inorganic Chemistry	55 th Edition	Shoban Lal Nagin Chand and Co., New Delhi	2020	I
2.	A .K. Srivastava	Organic Chemistry	1 st Edition	New Age International Publishers, New Delhi	2002	II & III
4.	R.L. Madan, G.D. Tuli	Simplified Course in Physical Chemistry	5 th Revised and enlarged Edition	S. Chand & Co., New Delhi	2009	IV & V

Web Reference:**Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:**

Semester	Code		Title of the Paper			Hours		Credits		
II	20UCH2AC3:1		INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY - II			4		3		
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓			✓		✓		
CO2	✓	✓	✓			✓	✓	✓		
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓	✓	✓			✓	✓	✓		
CO5	✓	✓	✓	✓		✓	✓	✓	✓	✓
Number of Matches = 36, Relationship : High										

Prepared by:

1. Dr. S. K. PERIYASAMY
2. Dr. S. S. SYED ABUTHAHIR

Note:

Checked by:

Dr. A. ZAHIR HUSSAIN

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
II	20UCH2AC3:2	Allied - III	INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY - II	4	3	100	25	75

(For B.Sc. Botany and Zoology)

Course Outcome (COs):

At the end of the course, students will be able to

CO1: Describe the properties of coordination compounds and their applications.

CO2: Infer the structure of nucleus and differentiate different forms of radioactivity.

CO3: Classify the sources, functions, deficiency disorders of vitamins and sort out medicines for different diseases.

CO4: Discuss the enzymes, hormones and their properties.

CO5: Compare the properties of different forms of colloids.

UNIT – I

12 hours

COORDINATION CHEMISTRY

1.1 **Co-ordination compound:** Terminologies -central metal ion, ligand, coordination number, types of ligands, Nomenclature of mononuclear complexes, Werner, Sidgwick and Pauling's Theory, Application of complexes in qualitative and quantitative analysis – Detection and estimation of nickel and aluminium.

1.2 **Biologically important co-ordination compounds:** Haemoglobin and Chlorophyll-structure and biological role.

UNIT – II

12 hours

NUCLEAR CHEMISTRY

2.1 **Structure of nucleus** - Composition of nucleus, nuclear forces, nuclear stability-mass defect, binding energy, n/p ratio, and magic numbers, [#]Definition of isotopes, isobars, isotones and isomers[#]

2.2 **Radioactivity**- Definition, types of radioactivity, Properties of α , β and γ rays: Detection and measurement – Wilson cloud chamber and G.M. Counter, nuclear fusion and fission reactions, applications of radio isotopes – in analytical chemistry, in medicine, rock dating and carbon dating.

UNIT –III

12 hours

VITAMINS AND CHEMOTHERAPY

3.1 **Vitamins** – Definition, classification. Sources and deficiency diseases of vitamins D, E, K, B₆, B₁₂ and C.

3.2 **Chemotherapy:** Definition, sulpha drugs - structure, preparation and uses of sulphapyridine, sulphathiazole and sulphadiazine, Antibiotics – Definition, structure and uses of penicillin and Chloromycetin.

UNIT – IV**12 hours****ENZYMES AND HORMONES**

- 4.1 **Enzymes**- Classification of enzymes, chemical nature, factors affecting rate of enzyme action, specificity of enzyme action, mechanisms of enzyme action – lock and key, biological functions of enzymes, applications of enzymes- therapeutic, analytical, industrial uses.
- 4.2. **Hormones**- introduction, structure and physiological functions - Adrenaline, thyroxine, oxytocin and insulin.

UNIT – V**12 hours****COLLOIDS**

- 5.1. **Colloids**: Definition, differences between true solution, colloidal solution and suspension, phases of colloidal solution-Electrical properties – Electrophoresis and Electro osmosis (definition and uses only) - protection of colloids – Gold number- medicinal applications of colloids.
- 5.2 **Emulsion**: definition, types, preparation, properties and applications.
- 5.3.**Gels**: definition, types, preparation, properties and applications.
- # _____ # Self study

Text books:

S.No.	Author Name	Book Name	Edition	Publisher Detail	Year	Units Covered
1.	Puri B.R., Sharma L.R., Kalia K.K.	Principles of Inorganic Chemistry	23 rd Edition	Shoban Lal, Nagin Chand & Co. New Delhi.	1993	I & II
2.	P.L. Soni and H.M. Chawla	Text Book of Organic Chemistry	28 th Edition	S. Chand & Co., New Delhi	1999	III
3.	Dulsy Fatima, L. M. Narayanan, R. P. Meyyan, K. Nallasingam, S. Prasannakumar and N. Arumugam,	Biochemistry	4 th Edition	Saras Publications, Nagercoil	2014	IV
4	B.R. Puri, L.R. Sharma and M.S. Pathania,	Principles of Physical Chemistry	48 th Edition	Vishal Publications, Jalandhar	2019	V

References:

S.No.	Author Name	Book Name	Edition	Publisher Detail	Year	Units Covered
1.	R. D Madan	Modern Inorganic Chemistry	2 nd reprint	S. Chand & Co., New Delhi	1987	I & II
2.	A .K. Srivastava	Organic Chemistry	1 st Edition	New Age International Publishers, New Delhi	2002	III
3.	R. L. Madan, G.D. Tuli	Simplified Course in Physical Chemistry	5 th revised and enlarged Edition	S. Chand & Co., New Delhi	2009	V

Web Reference:**Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:**

Semester	Code		Title of the Paper			Hours		Credits		
II	20UCH2AC3:2		INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY - II			4		3		
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓				✓	✓	✓		
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓		✓	✓		✓	✓	✓	✓	✓
CO4	✓	✓		✓		✓		✓		
CO5	✓	✓	✓		✓	✓	✓	✓		
Number of Matches = 35, Relationship : High										

Prepared by:

1. Dr. R. ABDUL VAHITH
2. Dr. M. YASEEN MOWLANA

Checked by: Dr. A. ZAHIR HUSSAIN**Note:**

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
II	20UCH2AC4P	Allied - IV	ORGANIC ANALYSIS-PRACTICAL	3	2	100	20	80

(For B.Sc. Physics, Botany and Zoology)

Course outcome (COs):

At the end of the course, students will be able to

- CO1: Analyze the nature of special element present in an organic compound
- CO2: Able to examine the nature of the double bond present in an organic compound.
- CO3: Differentiate the aliphatic and aromatic nature of the organic compounds.
- CO4: Identify the functional groups through appropriate chemical reactions
- CO5: Report the analysis of organic compound.

List of Practicals:

I. Qualitative analysis of the following organic compounds: -70 marks

1. Carbohydrate
2. Amide
3. Aldehyde
4. Ketone
5. Monocarboxylic acid
6. Amine
7. Monohydric phenol

II. Record -10 marks **Scheme of valuation**

Procedure Writing	-	10 marks
Organic analysis	-	60 marks
Special elements present / absent	-	20 marks
Aromatic/ aliphatic	-	10 marks
Saturated/ unsaturated	-	10 marks
Functional group present	-	20 marks

Books for Reference:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year	Units Covered
1	Venkateswaran V. Veerasamy R. Kulandaivelu A.R	Basic principles of Practical Chemistry	2 nd Edition	S. Chand & Co Pvt. Ltd, New Delhi	1997	All

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Paper			Hours		Credits		
II	20UCH2AC4P		ORGANIC ANALYSIS			3		2		
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓		✓	✓	✓		
CO2	✓		✓	✓	✓	✓	✓		✓	
CO3	✓		✓	✓		✓	✓	✓		
CO4	✓			✓	✓	✓	✓	✓	✓	
CO5	✓		✓			✓	✓		✓	
Number of Matches = 32, Relationship : Moderate										

Prepared by:

1. Dr. S.K. PERIYASAMY
2. Dr. S. S. SYED ABUTHAHIR

Checked by:

Dr. A. ZAHIR HUSSAIN

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. Marks	Internal marks	External marks
III	20UCH3CC5	Core-V	INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY-III	4	4	100	25	75

Course outcomes (COs):

At the end of the course, students will be able to

1. Compare the properties of alkali, alkaline earth and zero group elements and their compounds
2. Summarise the properties of Boron and Carbon group elements.
3. Categorise alkenes, alkynes and alcohols by applying appropriate chemical tests.
4. Interpret the mechanism of nucleophilic substitution and elimination reactions.
5. Discuss the electrical and magnetic properties of chemical compounds.

UNIT – I

12 Hours

s - BLOCK ELEMENTS AND NOBLE GASES

1.1. I-A and II-A Group Elements: Comparative study of elements and their oxides, hydroxides, carbonates and sulphates.

1.2. Noble Gases: General properties and uses, Separation of Noble gases from liquid air (Dewar's method), Fluoride compounds of xenon – XeF_2 , XeF_4 , XeF_6 , XeOF_4 , XeO_3 – Preparation, Properties and Structure. Clathrates of argon, krypton and xenon. #Glauber's salt, Chile saltpeter and Sodium azide#

UNIT – II

12 Hours

III-A and IV-GROUP ELEMENTS

2.1. Boron Group: Comparative study of boron group elements. Preparation, properties, structure and uses of H_3BO_3 , borax, diborane, boron nitride and borazole.

2.2. Carbon Group: Comparative study of carbon group and their hydrides, halides and oxides. Preparation and properties of carbonic acid, phosgene, carbon disulphide, cyanogens, HCN, HCNS and pseudo halogens.

2.3. Compounds of Aluminium: #Alumina#, precious gems and alums#.

UNIT – III

12 Hours

Olefins and Acetylenes

3.1. Alkenes – Preparation and properties of alkenes – electrophilic and free radical addition. Markownikoff's and anti-Markownikoff's rules.

3.2. Dienes - Conjugated – Non conjugated and Cumulated dienes – relative stabilities of dienes and chemical reactivity, 1,2 and 1,4- additions, Diels-Alder reaction.

3.3. Alkynes –Preparation from dihalides. Addition reactions - hydrogen, halogens, halogen acids, water, oxidation by KMnO_4 , ozonolysis. acidity of alkynes- formation of copper and silver acetylides and polymerisation.

UNIT –IV**12 Hours****ALCOHOLS AND ALKYL HALIDES**

4.1 Alcohols: Classification, isomerism, preparation and properties. Distinction between primary, secondary and tertiary alcohols by Lucas and Victor Meyer methods. Glycol – preparation and properties. Glycerol – preparation and properties.

4.2 Alkyl halides: Alkyl halide, vicinal dihalides and gem dihalides - Preparation and properties. Aliphatic Nucleophilic substitution reactions - mechanism of SN^1 , SN^2 and SN^i reactions.

Elimination reactions - mechanisms of E_1 and E_2 reactions – Saytzeff's and Hofmann rules.

4.3 Grignard reagent: Preparation and synthetic applications.

UNIT –V**12 Hours****ELECTRICAL AND MAGNETIC PROPERTIES OF MATTER**

5.1 Electrical Properties of Matter: [#]Polar and non-polar molecules, dipole moment, Stark effect[#], Polarization of molecules in an electric field - electronic polarization, atomic polarization and orientation polarization – Clausius - Mosotti equation (no derivation) and Debye equation (no derivation)- Methods to determine dipole moment – Temperature method and dilute solution method - applications of dipole moment - determining the percentage of ionic character of bonds- shapes of simple molecules (H_2O , CO_2 and NH_3).

5.2 Magnetic Properties of Matter: Magnetic flux, Magnetic Permeability, Magnetic susceptibility, Types of magnetism - dia, para, ferro and antiferro magnetism. Determination of magnetic susceptibility by Guoy balance method. Application to solving of simple structural problems.

TEXT BOOKS:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year	Units Covered
1.	P.L. Soni	Text book of Inorganic Chemistry	20 th Edition	Sultan Chand & Sons., New Delhi	1999	I & II
2.	Bahl and Arun Bahl	Advanced Organic Chemistry	19 th Edition	Sulthan and Chand company, New Delhi	2005	III & IV
3.	N. Kundu and S. K. Jain	Physical Chemistry	1 st Edition	S. Chand & Company Ltd..New Delhi	2000	V

Books for Reference:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year	Units Covered
1	R. D. Madan	Modern Inorganic Chemistry	3 rd Revised Edition	S. Chand & Co Pvt Ltd	2014	I & II
2	B. R. Puri, L. R. Sharma and K. C. Kalia	Principles of Inorganic Chemistry	1 st Edition	Milestone publishers and distributors, New Delhi,	2012	I & II
3	V. K. Ahluwalia	Text book of organic Chemistry Vol-I & Vol-II	1 st Edition	Ane's Student edition, New Delhi.	2010	III & IV
4.	Bahl and Arun Bahl	Advanced Organic Chemistry	19 th Edition	Sulthan and Chand company, New Delhi.	2014	III & IV
5.	J. N. Gutru and A. Gutru	Advanced Physical Chemistry	3 rd Edition	Pragathi Prakashan, Meerut	2016	V
6.	Puri, Sharma and Pathania	Principles of Physical Chemistry	41 st Edition	Vishal Publishing Co, Jalandhar	2004	V

Web References

1. <https://www.askiitians.com/iit-jee-s-and-p-block-elements/group-18-elements/>
2. <https://www.etoosindia.com/courses/neet/500743/p-block-carbon-boron-family-for-neet-by-jh-sir/detail.do>
3. <https://www.tcyonline.com/tests/alkanes-alkenes-and-alkynes>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester IV	Code 20UCH3CC5			Title of the Course INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY-III				Hours 4	Credits 4	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓			✓	✓	✓	✓	
CO2	✓	✓	✓	✓		✓	✓	✓		✓
CO3	✓	✓	✓	✓		✓	✓	✓		
CO4	✓	✓	✓	✓		✓	✓	✓	✓	
CO5	✓	✓	✓	✓		✓	✓	✓	✓	
Number of Matches= 38 , Relationship is : HIGH										

Prepared by:

1. Dr. S. S. Syed Abuthahir

Checked by:

Dr. K. Riaz Ahamed

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Core	Title of the Course	Hours	Credits	Max. Marks	Internal Marks	External Marks
III	20UCH3CC6P	Core – VI	Preparation of Domestic Products and their Quality Testing - Practical	3	2	100	20	80

Course outcomes (COs):

At the end of the course, students will be able to

1. Select the chemicals required for the domestic product preparation.
2. Produce the products in small scale
3. Appraise the quality of domestic products.
4. Formulate the combination for commercialisation
5. Become an enterperuner.

List of Practicals:

I. Preparation and Quality Measurements of Domestic Products

- 55 marks

1. Detergent washing powder ; pH, Surface tension, Cleaning ability and Foaming ability
2. Utensils cleaning powder ; pH, Surface tension, Cleaning ability and Foaming ability
3. Normal shampoo ; pH, Surface tension, Cleaning ability and Foaming ability
4. Tooth paste ; pH, Abrasiveness, Cleaning ability and Foaming ability
5. Decarboniser ; pH, Surface tension, Cleaning ability and Abrasiveness
6. Sanitizer chemicals and liquid wash ; pH, Surface tension, Cleaning ability and Foaming ability
7. LCD Screen Cleaner ; pH, Surface tension, Cleaning ability and Abrasiveness
8. Moisturizers (Hand Lotion , Body Lotion and After shave Lotion); pH, Surface tension, Moisturizing ability and Abrasiveness
9. Room freshener and Jasmine perfume liquid ; pH, Surface tension,

II. Video Presentation

-15 marks

Preparation of 3-5 minutes video presentation for marketing the products

III. Record

-10 marks

SCHEME OF VALUATION

Procedure writing	: 10 marks
Preparation of Domestic Product	: 25 marks
Quality testing: 4 x 5 (each method 5 marks)	: 20 marks
Video presentation	: 15 marks

Text Books:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year	Units Covered
1.	Hilda Butler	Pouchers-Perfumes, Cosmetics and Soaps,	10 th Edition,	Springer, New Delhi,	2007	All

Books/ Research Articles for Reference:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year	Experiments Covered
1	Meena Khetrapal and <i>et al</i>	Comparative Study of Detergents in India –A step towards more Sustainable Laundry	http://journals.du.ac.in/ugresearch/pdf/J15.pdf	DU Journal of Undergraduate Research and Innovation	-	1,2, 6
2	Thakkar Krunali, Patel, D.M. Meshram and Patel mitesh	Evaluation of Standards of some selected shampoo preparation	2(5), p3622-3630	World Journal of Pharmacy and pharmaceutical Science	2013	3, 6
3	Joel ogboji and I. Y Chindo	Formulation, physiochemical evaluation and antimicrobial activity of green tooth paste on streptococcus mutans	6(1), p108-113.	International journal of Advanced chemistry	2018	4, 5, 7, 8

Web Reference:**Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:**

Semester IV	Code 20UCH3CC6P					Title of the Course Practical -III Preparation of Domestic Products and their Quality Testing			Hours 3	Credits 2
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓		✓	✓	✓
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4		✓		✓	✓	✓	✓	✓		✓
CO5	✓	✓	✓	✓	✓	✓	✓	✓		✓
Number of Matches= 45, Relationship is : HIGH										

Prepared by:

1. Dr. M. Purushothaman
2. Mr. M. Varusai Mohamed

Checked by:

Dr. M. Syed Ali Padusha

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. Marks	Internal Marks	External Marks
III	20UCH3GE1A	Generic Elective -I	CHEMISTRY IN DAILY LIFE	2	2	100	--	100

Course Outcomes (COs):

At the end of the course, students will be able to

1. Understand the nature of essential oils and perfumes
2. Formulate the cosmetic products
3. Explain the chemistry of dyes and highlight their importance
4. Appreciate the importance of polymers
5. Compare the properties of fuels and fire protectors.

UNIT-I

6 hours

Essential oils and Perfumes:

- 1.1. Essential oils: Definition, occurrences, isolation of essential oil - **#steam distillation#** and expression method.
- 1.2. Perfumes: Definition, Requirements of a good perfume, composition of perfumes - vehicle, fixative, odoriferous substance, classification of perfumery materials-animals-synthetic-formulations.

UNIT-II

6 hours

Cosmetics:

- 2.1. Face cream, vanishing cream, sun screen lotion, shaving cream, talcum powder – composition – formulation – preparation, uses and their hazards.
- 2.2. Sprayer, hand lotion, nail lacquers, nail bleaches, bath oil **#hair oil, hair dyes #**-composition- formulation – preparation, uses and their hazards.

UNIT-III

6 hours

Dyes:

- 3.1 Definition, requirement of a good dye, colour and constitution – Classification of dyes by structure, theory, chromophore, chromogen and auxochrome, classification of dyes based on applications - acid, base direct, mordant, oxidation, vat, disperse and azo dyes- physical properties, examples and uses.
- 3.2 Preparation and uses of alizarin, Bismarck brown, indigo, **#methyl orange, phenolphthalein#** and malachite green.

UNIT-IV

6 hours

Polymers:

- 4.1 Definition - classification of polymers - addition and condensation - Preparation and uses of PVC, Orlon, PTFE, polystyrene, terylene and nylon 6, 6.
- 4.2 Plastics -**# thermo and thermosetting plastics#** examples – differences – properties - uses.

UNIT-V

6 hours

Fuels and Fire Extinguishers:

- 5.1 Fuel: Definition, classification - solid, liquid and gaseous fuels, requirements of a good fuel-composition and uses of **#LPG#**, gobar gas, bio gas and water gas.
- 5.2 Fire Protection: Causes of fire accidents in homes, fire fighting in homes – methods of extinguishing fire, chemical fire extinguishers - merits and demerits. Important of safety requirements Automatic fire detection cum control, causes and fire fighting.

Self-study portion

Text Books:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year	Units Covered
1.	Thangammal Jacob	A Textbook of Applied Chemistry	5 th Edition	McMillan Company Ind. Ltd	1979	I,II,V
2.	P. L. Soni and H. M. Chawla	Text Book of Organic Chemistry	28 th Edition	Sulthan and Chand company, New Delhi	1999	III,IV

Books for Reference:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year	Units Covered
1	B. K.Sharma	Industrial Chemistry	1 st Edition	Goel Publishing House,Meerut	1983	I,II,III
2	Jayashree Ghosh	Fundamental Concepts of Applied Chemistry	1 st Edition	S.Chand Company Ltd – New Delhi,	2006	IV,V

Web Reference: <https://www.clearitmedical.com/2019/04/chemistry-notes-chemistry-in-everyday-life.html>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester IV	Code 20UCH3GE1A			Title of the Course CHEMISTRY IN DAILY LIFE				Hours 2	Credits 2	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓			
CO2	✓		✓		✓	✓	✓	✓		✓
CO3	✓	✓	✓	✓		✓	✓			
CO4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO5	✓	✓	✓		✓	✓	✓	✓		✓
Number of Matches= 38 , Relationship is : HIGH										

Prepared by:

Checked by: Dr. M. YASEEN MOWLANA.

1. Dr. S.K. PERIYASAMY

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. Marks	Internal Marks	External Marks
III	20UCH3GE1B	Generic Elective -I	AGRICULTURAL CHEMISTRY	2	2	100	--	100

Course Outcomes (COs):

At the end of the course, students will be able to

1. Classify the soil based on its nature
2. Understand the colloidal properties of soil
3. Appraise the quality of soil
4. Appreciate the importance of supplementary nutrients of soil.
5. Recognize the role of pesticides in agriculture

UNIT – I

6 hours

SOIL CHEMISTRY

1.1. Soil chemistry: introduction- classification of soil – soil profile – soil taxonomy – properties

of soil- soil water- gravitation water- capillary water- hygroscopic water- water vapour – combined water.

1.2 Terminology used in soil water status – field capacity – wilting point-**#soil air – soil Temperature#** – soil minerals – primary mineral – secondary minerals.

UNIT – II

6 hours

COLLOIDAL PROPERTIES OF SOIL

2.1. Definition – classification of soil colloids – inorganic colloids – silicate clays- oxides of iron and aluminium- organic colloids – cation exchange capacity- methods of determination of cation exchange capacity- anion exchange capacity

2.2 Properties of colloids-electrical properties- dispersion – coagulation – **#tyndal phenomenon- Brownian movement#** – dialysis

UNIT – III

6 hours

SOIL REACTIONS

3.1 Soil reaction- soil acidity- causes of acidity – cropping – **#fertilizers#**- rain fall – soil alkalinity– high lime- saline soils- alkali soil – saline-sodic soil.

3.2 Buffering of soils –amending the soil – reclamation of acid soil – liming agent – reclamation of alkaline soil.

UNIT – IV

6 hours

ORGANIC MANURES AND CHEMICAL FERTILIZERS

4.1 Soil fertility – soil productivity – types of soil fertility – nutrients –macro nutrients micronutrients – organic manures – farmyard manure – compost –oil cakes – bone meal– blood meal – meat meal – fish meal- green manure.

4.2 Chemical fertilizers – requisites of a good fertilizer – classification of fertilizers – straight fertilizers – urea – calcium ammonium nitrate – ammonium sulphate – ammonium chloride – phosphatic fertilizers – super phosphate of film – triple super phosphate – muriate of potash – pupate of potash – schoenite-complex fertilizers- **#effect of excess fertilization#** – eutrophication – agrochemicals.

UNIT – V**6 hours****PESTICIDES**

5.1 Insecticides – classifications – stomach poisons , contact poison- fumigants – herbicides – classifications- selective and non selective herbicide – **#Fungicides#**.

5.2 Rodenticides – nematicides – classifications – fumigants – non fumigants- land preparation of nematicides- multipurpose soil fumigants- fumigant nematicides , non – fumigant nematicides.

Self Study # portion**Text Books:**

S. No.	Author Name	Book Name	Edition	Publisher detail	Year	Units Covered
1.	K. Bagavathi Sundari	Applied Chemistry	First edition	MJP Publishers Chennai	2006	I, II, III, IV &V

Books for Reference:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year	Units Covered
1	Jayashree Ghosh	Fundamental Concepts of Applied Chemistry	First edition	S. Chand Company Ltd – New Delhi	2006	I, II, III, IV &V

Web Reference: <https://nptel.ac.in/courses/126/105/126105016/>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code					Title of the Course			Hours	Credits
IV	20UCH3GE1B					AGRICULTURAL CHEMISTRY			2	2
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓			
CO2	✓	✓	✓		✓	✓	✓	✓		✓
CO3	✓	✓	✓	✓		✓	✓			
CO4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO5	✓	✓	✓							✓
Number of Matches= 35, Relationship is : HIGH										

Prepared by:

1. Dr. S. K. Periyasamy
2. Dr. M. Yaseen Mowlana

Note:

Checked by

Dr. J. Sirajudeen

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
IV	20UCH4CC7	Core-VII	INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY-IV	5	5	100	25	75

Course Outcomes (COs):

At the end of the course, students will be able to

1. Describe the chemistry of binary compounds and alloys and metallurgy.
2. Analyze the aromaticity of the organic compounds and their mechanism towards electrophilic substitution.
3. Understand the properties of carbonyl compounds and ethers.
4. Infer the concepts of acids and bases.
5. Explain the kinetics of chemical reactions.

UNIT-I

15 Hours

BINARY COMPOUNDS AND METALLURGY

1.1. Binary compounds: Borides, Hydrides, Carbides, Nitrides – Classification, structure-bonding and uses.

1.2. Metallurgy: Occurrence of metals in India – Extraction of V and Ti from their ores. Concentration of ores – Froth floatation, Magnetic separation, roasting, smelting. Purification of metals - Reduction, Electrolysis, Van Arkel process, [#]Zone refining, Aluminothermic process[#].

1.3. Alloys: Classification - Preparation and properties – role of carbon in steel – important alloys – composition – uses (Bronze, Brass, Duralamine, gun metal, stainless steel).

UNIT – II

15 Hours

REACTIONS OF AROMATIC COMPOUNDS

2.1 Aromaticity: Resonance in benzene - delocalised cloud in benzene Huckel's rule and its application to aromaticity of benzenoid (benzene, naphthalene and phenanthrene) and non-benzenoid (cyclopropenium cation and cyclopentadienyl anion) compounds.

2.2 Aromatic Electrophilic substitution reactions: General mechanism of electrophilic reactions – Halogenation, nitration and sulphonation. Fridel-Craft's alkylation and acylation reactions. Orientation effects of various substituents – ortho/para ratio. Nuclear and side chain halogenations of toluene.

UNIT – III

15 Hours

CARBONYL COMPOUNDS AND ETHERS

3.1. Carbonyl Compounds: General methods of preparation and properties of acetone and acetaldehyde. Benzaldehyde, Benzophenone and acetophenone preparation and properties.

3.2. Ethers: Isomerism – Preparation, properties and uses of Anisole, thioether and mustard gas.

UNIT –IV**15 Hours****CONCEPTS OF ACIDS AND BASES**

4.1 **Acids and bases** – #Arrhenius, Bronsted- Lowry and Lewis concepts of acids and bases
#– Ionic Equilibria - Buffer solution – Definition, buffer action mechanism and its uses – Buffer capacity - various measurement scales for the strength of acids and bases, pH, pOH, and pKa - calculation of pH of a buffer by Henderson's equation -

4.2 **Hydrolysis of salts** – Definition, - salt of weak acid and strong base, salt of weak base - strong acid and salt of weak acid and weak base- hydrolysis constant (K_h), relation between K_h , K_a and K_w , Degree of hydrolysis - salt of weak acid - strong base, salt of weak base - strong acid and salt of weak acid - weak base.

UNIT – V**15 Hours****CHEMICAL KINETICS, CATALYSIS AND PHOTOCHEMISTRY**

5.1 **Chemical Kinetics:** Rate and rate constant – factors affecting rate of reactions – Temperature effect on reaction rate - Arrhenius rate equation, energy of activation and its significance,. Theories of reaction rates – simple collision theory, Absolute Reaction Rate Theory (ARRT) to simple uni-molecular and bimolecular processes - Comparison of collision theory & ARRT (Solving problems using Arrhenius rate equation)

5.2 **#Catalysis:** Catalyst, types of catalysts - homogeneous and heterogeneous catalysis# – theories of catalysis- Intermediate compound formation theory and modern adsorption theory - synthetic and industrial importance of catalyst.

5.3 **Photochemistry:** Differences between thermal and photochemical reactions- Laws of photochemistry, Definition - quantum yield and chemical actinometry.

TEXT BOOKS:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year	Units Covered
1.	B.R. Puri, L.R.Sharma and K.C.Kalia	Principles of Inorganic Chemistry	1 st Edition	Milestone Publishers and distributors, New Delhi	2012	I
3.	Bahl and Arun Bahl	Advanced Organic Chemistry	19 th Edition	Sulthan and Chand Company, New Delhi	2005	II & III
4.	B. S. Bahl, G. D. Tuli and Arun Bahl	Essentials of Physical Chemistry	25 th Edition	S. Chand & Company Ltd. New Delhi	1999	IV & V
5	P.W. Atkins	Physical Chemistry	7 th edition	() Oxford University Press	2009	IV & V

REFERENCES:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year	Units Covered
1	B. R. Puri, L. R. Sharma and K. C. Kalia	Principles of Inorganic Chemistry	1 st Edition	Milestone publishers and distributors, New Delhi,	2012	I
2	V. K. Ahluwalia	Text book of Organic Chemistry Vol-I & Vol-II	1 st Edition	Ane's Student edition, New Delhi.	2010	II & III
3.	Dr. Jagadamba Singh	Undergraduate Organic Chemistry - UGC Curriculum Vol. I & Vol. II	1 st Edition	Pragati Prakashan, Meerut.	2007	II & III
4.	R. L. Madan, G. D. Tuli	Simplified Course in Physical Chemistry	5 th Edition	S. Chand & Co., New Delhi	2009	IV & V
5.	J. N. Gurtu and A. Gurtu	Advanced Physical Chemistry	3 rd Edition	Pragathi Prakashan, Meerut	2016	IV & V

Web References

- 1 <https://nptel.ac.in/courses/113/105/113105024/>
- 2 <https://www.khanacademy.org/science/organic-chemistry/aromatic-compounds>
- 3 <https://study.com/academy/topic/ethers-carbonyl-compounds.html>
4. <https://www.khanacademy.org/science/chemistry/acids-and-bases-topic>

Mapping:

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester	Code			Title of the Course				Hours		Credits	
IV	20UCH4CC7			INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY-IV				5		5	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓	✓	✓			✓	✓	✓			
CO2	✓	✓	✓	✓		✓		✓		✓	
CO3	✓	✓		✓		✓	✓		✓		
CO4	✓	✓	✓	✓		✓		✓	✓		
CO5	✓	✓	✓	✓		✓	✓	✓		✓	
Number of Matches = 34,						Relationship is : Moderate					

Prepared by:

1. Dr. S.S. Syed Abuthahir

Note:

Checked by:

Dr. K. Riaz Ahamed

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. Marks	Internal Marks	External Marks
IV	20UCH4CC8P	Core – VIII	QUALITATIVE ANALYSIS OF INORGANIC SALTS - PRACTICAL	3	2	100	20	80

Course Outcomes (COs):

At the end of the course, students will be able to

1. Understand the principles of inorganic qualitative analysis.
2. Apply the appropriate methods for identifying the radicals in a mixture systematically.
3. Prepare reagents required for the analysis
4. Develop skills to execute reactions in micro level.
5. Present the report of the analysis.

List of Practicals:

I. Qualitative analysis of inorganic salts

- 70 marks

Analysis of a mixture containing **two cations** and **two anions** of which one will be an **interfering ion** by Semi micro methods.

Cations to be analysed:

Lead, copper, bismuth, cadmium, tin, iron, zinc, manganese, cobalt, nickel, barium, calcium, strontium, magnesium and ammonium.

Anions to be analysed:

Carbonate, sulphide, sulphate, nitrate, chloride, bromide, fluoride, borate, oxalate and phosphate.

II. Record

-10 marks

Scheme of valuation

Procedure Writing	: 10 marks
4 radicals correct with suitable tests	: 60 marks
3 radicals correct with suitable tests	: 45 marks
2 radicals correct with suitable tests	: 30 marks
1 radical correct with suitable tests	: 15 marks

Text Books:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year	Units Covered
1.	V. Venkateswaran, R. Veerasamy and A.R.Kulandaivelu	Basic principles of Practical Chemistry	2 nd Edition	Sultan Chand & Sons, New Delhi.	1997	All

Books for Reference:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year	Units Covered
1	G. Svehla and B. Sivasankar	Vogel's Qualitative Inorganic Analysis	7 th Edition	Pearson Education India	2012	All

Web Reference:

1. https://en.wikipedia.org/wiki/Qualitative_inorganic_analysis
2. <https://portal.rpmcollege.org/tutorial/chemistry-p/year-0/systematic-qualitative-analysis-of-an-unknown-inorganic-salt>

Mapping:

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
IV	20UCH4CC8P		Practical – IV Qualitative analysis of inorganic salts			3			2	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CO2	✓	✓	✓	✓		✓	✓	✓	✓	
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓		✓	✓	✓	✓	
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of matches (✓) =45, Relationship: Very High										

Prepared by:
1. Dr. R. Abdul Vahith

Checked by:
Dr. K. Loganathan

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. Marks	Internal Marks	External Marks
IV	20UCH4GE2A	Generic Elective -II	FOOD AND NUTRITION	2	2	100	---	100

Course Outcomes (COs):

At the end of the course, students will be able to

1. Categorize the major components of foods in the environment.
2. Investigate the biological functions of minerals and vitamins.
3. Analyze the importance of meal planning and diet
4. Explain the causes of food spoilage and principles of different techniques used in preservation of foods.
5. Identify the adulterants added to foods and interpret government regulations for food safety and standards

UNIT – I

6 hours

FOOD AND ITS CONSTITUENTS

1.1 Food: Definition - Classification based on nutritional values, nutritive values of cereals and nuts - oil seeds. Milk - **#milk products#**, composition of milk, water present in milk, milk protein and milk sugar.

1.2 Sources, biological functions, deficiency diseases and Recommended Dietary Allowance (RDA) of carbohydrates, protein and fats.

UNIT – II

6 hours

MINERALS AND VITAMINS

2.1 Minerals: Dietary sources, Physiological functions, effects of deficiency and requirements of calcium, phosphorous, iron, fluorine, iodine, **#sodium and potassium#**.

2.2 Vitamins: Classification - fat and water soluble vitamins, food sources, effects of deficiency and RDA.

UNIT – III

6 hours

MEAL PLANNING

3.1 Importance of meal planning-importance of mother's milk-diets for school children - adolescents - pregnant and lactating women.

3.2 Diet during fever, dysentery, anemia, blood pressure, corona virus **#obesity and diabetes#**.

UNIT – IV

6 hours

FOOD SPOILAGE AND PRESERVATION

4.1 Food spoilage-causes of food spoilage-fermentation, rancidity, autolysis and putrefaction food poisoning.

4.2 Food Preservation: principle and importance - methods of preservation, freezing, canning, pickling, salting, smoking, bottling, sterilization, refrigeration, dehydration, heating, **#radiation and preservative agents #**.

FOOD ADULTERATION

5.1 Food adulteration - Definition, classification - common adulterants in food-detection and ill Effects - packing hazards - food additives.

5.2 Practical rules for good sanitation of food - Food laws and standards – Bureau of Indian Standards, # **AGMARK and Consumer Protection act** #.

..... # **Self-study portion**

Text Books:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year	Units Covered
1.	Dr. M. Swaminathan	Handbook of food and Nutrition	5 th Edition	Printing and Publishing Co Ltd, Bangalore,	2007	I, II & III
2.	B. Srilaksmi	Food Science	3 rd edition	New Age International (P) Ltd, New Delhi	2005	I,II,III,IV & V
3.	M. Raheena Begum	A Text Book of Foods, Nutrition and Dietetics	3 rd Edition	Strling Publishers, New Delhi	2010	V

Books for Reference:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year	Units Covered
1	Jayashree Ghose	Fundamental Concepts of Applied Chemistry	1 st Edition	S. Chand and Company (P) Ltd, New Delhi	2006	I & II
2	Morris B. Jacobs	The Chemical Analysis of Foods and Food Products	3 rd Edition	CBS Publishers and Distributors, New Delhi	1993	III, IV & V
3	H.K. Chopra and P.S. Panesar	Food Chemistry	3 rd Edition	Narosa Publisher, New Delhi	2010	I,II & IV

Web Reference: https://nptel.ac.in/content/syllabus_pdf/126104004.pdf

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours	Credits			
IV	20UCH4GE2A		FOOD AND NUTRITION			2	2			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓		✓	✓
CO2	✓	✓	✓		✓	✓	✓	✓		✓
CO3	✓	✓	✓	✓		✓	✓			
CO4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO5	✓	✓	✓		✓	✓	✓	✓		✓
Number of Matches= 41 , Relationship is : HIGH										

Prepared by:
1. Dr. M. YASEEN MOWLANA

Checked by:
Dr. S.K. PERIYASAMY

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. Marks	Internal Marks	External Marks
IV	20UCH4GE2B	Generic Elective -II	NANOSCIENCE AND ITS APPLICATIONS	2	2	100	---	100

Course Outcomes (COs):

At the end of the course, students will be able to

1. Understand rudiments of nanoscience
2. Synthesis nanomaterials using different methods
3. Characterize nanomaterials using advanced techniques
4. Appreciate the applications of nanomaterials
5. Correlate nano technology and nature.

UNIT I

6 hours

INTRODUCTION TO NANOSCIENCE

- 1.1 Definition of a nano system - classification of nanocrystals - dimensionality and size dependent phenomena; **#Quantum dots#**, Nanowires and Nanotubes, 2D films; Nano and mesoporous.
- 1.2 Misnomers and misconception of Nanotechnology importance of the nano scale materials and their devices -size dependent variation in mechanical- physical and chemical, magnetic, electronic transport, reactivity.

UNIT II

6 hours

SYNTHESIS OF NANOMATERIALS

- 2.1 Nucleation and growth of nanosystems; self-assembly, mechanical milling, laser ablation, sputtering and microwave plasma, chemical reduction and oxidation, hydrothermal, micelles, **#sol-gel processes#**, photolysis, radiolysis, and metallo-organic chemical vapor deposition; designing of advanced integrated nanocomposites, functional nanomaterials and nanostructured thin films.
- 2.2 Top down and bottom up approaches-synthesis of carbon nanotubes, gold and silver nanoparticles.

UNIT III

6 hours

CHARACTERIZATION OF NANOMATERIALS

- 3.1 Atomic force microscopy-general concepts and defining characteristics of AFM-Scanned –proximity probe microscope –Laser beam deflection-AFM cantilevers-piezoceramics-feedback loop- alternative imaging modes- AFM and biology.
- 3.2 Electron microscopy techniques-resolution Vs magnification-scanning electron microscopy, - electron gun – specimen interaction – environmental scanning electron microscope.**# transmission electron microscopy#**, High resolution TEM- Contrast transfer function.

UNIT IV

6 hours

APPLICATION OF NANOMATERIALS

- 4.1 Nano Semiconductors- Nanoscale electronic devices including CMOS, Potentiometric sensors - MRAM devices, Spintronic devices including spin valves- Nanopolymers-nanocomposites, Nanoparticles polymer ensembles;
Nanopolymers in Catalysis. Nanocomposites- Metal-Metal nanocomposites, Polymer-Metal nanocomposites, Ceramic nanocomposites: Dielectric and CMR based nanocomposites -solar cells-smart materials-molecular electronics- **#biosensors#** .
- 4.2 Medical diagnostics and treatments – colloidal stability – photonic band gap materials – chemical libraries – colorimetry and biosensing- Therapeutic applications and drug delivery.

UNIT V**6 hours****NANOTECHNOLOGY IN AGRICULTURE**

5.1 Nanotechnology in Agriculture -Precision farming, Smart delivery systems – Insecticides using nanotechnology – Potential of nano-fertilizers – Potential benefits in Nanotechnology in Food industry – Global Challenges- Product innovation and Process improvement- Consumer benefits.

5.2 The science behind the nanotechnology in lotus effect-self-cleaning property of lotus - gecko foot climbing ability of geckos-water strider-**#antiwetting property of water striders#**-spider silk mechanical properties of the spider silk.

..... # **Self-study portion**

Text Books:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year	Units Covered
1.	T.Pradeep	Nano: The Essentials: Understanding Nanoscience and Nanotechnology	1 st Edition	McGraw-Hill Professional Publishing, New york	2008	I,II,III,IV,V
2.	Jennifer Kuzma and Peter Ver Hage	Nanotechnology in agriculture and food production	1 st Edition	Woodrow Wilson International Center,	2006	V
3.	K. K Chattopadhyay and A.N. Banerjee	Introduction to Nanoscience and Nanotechnology	1 st Edition	PHI ,Learning private limited ,New Delhi	2009	I,III

Books for Reference:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year	Units Covered
1.	J.Dutta, H.F. Tibbals and G.L. Hornyak	Introduction to Nanoscience	1 st Edition	CRC press, BocaRaton	2008	I,II,III,IV & V
2.	WM .Breck	Nanotechnology	1 st Edition	CBS Publishers & Distributors PVT Ltd, India	2016	IV

Web Reference: <https://nptel.ac.in/courses/113/106/11310609>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code					Title of the Course					Hours	Credits
IV	20UCH4GE2B					NANOSCIENCE AND ITS APPLICATIONS					2	2
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	✓	✓	✓	✓	✓	✓	✓		✓	✓		
CO2	✓	✓	✓		✓	✓	✓	✓				
CO3	✓	✓	✓	✓		✓	✓					
CO4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
CO5	✓	✓	✓		✓	✓	✓	✓		✓		
Number of Matches= 40 , Relationship is : HIGH												

Prepared by:

1. Dr. S. K. Periyasamy
2. Dr. M. Yaseen Mowlana

Checked by:

Dr. M. Purushothaman

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
V	20UCH5CC9	Core-IX	CHEMISTRY OF p-BLOCK ELEMENTS AND RADIOACTIVE NUCLIDES	6	5	100	25	75

Course Outcomes (COs):

At the end of the course, students will be able to

- 1: Describe the chemistry of oxygen and halogen family elements.
- 2: Analyse the compounds of silicon and polyacids
- 3: Infer the chemistry of nitrogen family
- 4: Gain knowledge on nuclear models and isotopes
- 5: Understand techniques used for the measurement of radioactivity

UNIT – I

18 hours

OXYGEN AND HALOGEN FAMILY

- 1.1 Oxygen Family: Comparative study of elements, ozone – manufacture – Siemens - Halske ozoniser, Brodie's ozoniser, properties, uses. Sulphur – properties, allotropic modifications, compounds of sulphur – Oxide (SO_2), Oxyacid (H_2SO_3), [#]Peracids of sulphur - Caro's acid, Marshall's acid – Preparation - Properties[#]
- 1.1. **Halogen Family:** Comparative study of halogens and their compounds – Oxides and Oxyacids of halogens (Structure only) Basicity of Iodine; Chemistry of Astatine. Interhalogen compounds - preparation, properties and structures (ClF_3 , IF_5 , IF_7) - Polyhalides – properties and structures (ICl_2^- , IF_4^+).

UNIT- II

18 hours

COMPOUNDS OF SILICON AND POLYACIDS

- 2.1 **Silicon** – Occurrence, types - preparation, properties and uses, compounds of silicon - SiO_2 , SiH_4 , SiCl_4 , SiC – structure, properties and uses.
- 2.2 **Silicates:** Definition – Classification – Ortho, Pyro, Chain structures, sheet silicates, three – dimensional silicates – Composition, structure and uses. Silicones – types, preparation, properties and uses. [#] Silicone rubbers - important uses[#].
- 2.3. **Isopolyacids** – Definition, preparation of isopolyacids of chromium and tungsten.

UNIT – III

18 hours

NITROGEN FAMILY

- 3.1 **Nitrogen group:** Comparative study of elements and their compounds, Oxides of nitrogen - nitrous oxide, nitric oxide, dinitrogen trioxide and [#]oxyacids - nitrous acid, nitric acid - preparation, properties and uses[#]
- 3.2 **Compounds of nitrogen:** Hydrazine, hydrazoic acid, hydroxyl amine and liquid ammonia - preparation, properties and uses
- 3.3 **Phosphorous and its compounds:** Allotropic modifications - White phosphorous – preparation and properties of P_2O_5 , ortho and pyro phosphoric acids, Graham salt and phosphine

UNIT – IV**18 hours****NUCLEAR CHEMISTRY**

- 4.1. **Structure of nucleus** - Composition of nucleus, nuclear forces, nuclear stability-mass defect, binding energy, BE/nucleon - n/p ratio, and magic numbers. whole number rule and packing fraction. #Definition of isotopes, isobars, isotones and isomers#
- 4.2. **Nuclear Models:** Nuclear shell model and liquid drop model. Nuclear Forces - Meson theory.
- 4.3. **Applications of radio isotopes** – Determination of reaction mechanism - ester hydrolysis and photosynthesis; medicinal field - ^{24}Na , ^{42}K , ^{14}C , ^{32}P , ^{51}Cr , ^{64}Cu , ^{60}Co , ^{59}Fe , ^{186}Rh ; rock dating and carbon dating.

UNIT – V**18 hours****RADIOACTIVITY**

- 5.1. **Radioactivity**- Definition, types of radioactivity, #Properties of α , β and γ rays#: Detection and measurement – Wilson cloud chamber and G.M. Counter. Modes of decay, decay constant, half-life period and average life period, group displacement law and radioactive series.
- 5.2. **Nuclear reactions:** Nuclear Fission – Atom bomb and nuclear reactor. Nuclear Fusion – #Hydrogen bomb and stellar energy#
- 5.3. **Artificial radio activity** - definition, proton, deuteron, neutron and particle induced transmutations.

_____ # Self study

TEXTBOOKS:

S. No.	Author Name	Book Name	Edition	Publisher Detail	Year	Units Covered
1.	P.L. Soni, Mohan Katyal	Textbook of Inorganic Chemistry	Revised Edition	Sulthan Chand & Sons, New Delhi	2013	I, II, III, IV, V
2.	Wahid Malik, G.D.Tuli and R.D.Madan	Selected Topics in Inorganic Chemistry	Revised Edition	S. Chand & Co, New Delhi	2010	I
3.	Satya Prakash, G.D. Tuli, S.K. Basu, R.D. Madan	Advanced Inorganic Chemistry, Vol-I	19 th Edition	S Chand & Co Ltd, New Delhi	2011	IV, V
4.	R.D. Madan	Modern Inorganic Chemistry	4 th Edition	S. Chand & Company Ltd, New Delhi	2014	IV, V

Books for Reference:

S. No.	Author Name	Book Name	Edition	Publisher Detail	Year	Units Covered
1.	J.D. Lee	Concise Inorganic Chemistry	5 th Edition	Blackwell Science Ltd., France	2014	I, II, IV, V
2.	B.R. Puri, L.R.Sharma and K.C.Kalia	Principles of Inorganic chemistry	33 rd Edition	Vishal Publishing Co, New Delhi	2020	I, II, II, IV, V
3.	Gurdeep Raj	Advanced Inorganic Chemistry-Vol.-I	Revised Edition	Krishna Prakashan Media (P) Ltd	2014	I, II, II, IV, V
4.	Gurdeep Raj	Advanced Inorganic Chemistry-Vol.-II	Revised Edition	Krishna Prakashan Media (P) Ltd	2014	I, II, II, IV, V
5.	H. J. Arnikar	Essentials of Nuclear Chemistry	4 th Edition	New Age International Private Limited	2011	IV, V

Web Reference: Unit: IV & V: <https://nptel.ac.in/courses/112/103/112103243/>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programm SpecificOutcomes:

Semester	Code		Title of the Paper			Hours		Credits		
V	20UCH5CC9		Chemistry of p-Block Elements and Radioactive Nuclides			6		5		
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓		✓	✓	✓	✓	
CO2	✓	✓	✓		✓	✓	✓	✓	✓	
CO3	✓	✓		✓		✓		✓	✓	
CO4	✓		✓			✓	✓	✓	✓	✓
CO5	✓	✓	✓			✓	✓	✓	✓	✓
Number of Matches= 37, Relationship : High										

Prepared by:

1. Dr. K. Loganathan
2. Dr. N. Mujafarkani

Checked by: Dr. A. Jamal Abdul Nasser

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
V	20UCH5CC10	Core – X	ORGANIC COMPOUNDS CONTAINING O, N & S AND NAME REACTIONS	5	5	100	25	75

Course Outcomes (COs):

At the end of the course, students will be able to

- 1: Understand the chemistry of heterocyclic and polynuclear hydrocarbons
- 2: Know the properties of carboxylic acid and its derivatives
- 3: Discuss the properties and uses of phenols
- 4: Synthesize nitrogen containing organic compounds
- 5: Identify the reagents for selective organic reactions

UNIT – I

15 hours

HETEROCYCLIC AND POLYNUCLEAR HYDROCARBONS

- 1.1. **HETEROCYCLICS:** Classification, Preparation, reactions and uses of furan, pyrrole, thiophene and pyridine. Comparison of basicity of pyrrole, pyridine and piperidine.
- 1.2. Quinoline, Isoquinoline and Indole synthesis with special reference to Skraup, Fischer-indole and Bischler-Napieralski - properties and uses.
- 1.3. **Polynuclear hydrocarbons:** Naphthalene and anthracene – resonance structures, preparation by Haworth synthesis, properties - oxidation, reduction, sulphonation, nitration, halogenations and uses. Biphenyl preparation and uses.

UNIT – II

15 hours

CARBOXYLIC ACIDS AND THEIR DERIVATIVES

- 2.1. **Monocarboxylic acids:** Acetic acid–preparation, properties and uses. Ionization of carboxylic acids – Acidity constant – Comparison of acid strengths of substituted benzoic acids. Arndt - Eistert synthesis.
- 2.2. **Dicarboxylic acids:** preparation, properties and uses of oxalic, malonic, succinic, phthalic and adipic acids.
- 2.3. **Acid derivatives:** Acid chloride - Preparation and properties of acetyl chloride.
Esters - Preparation, properties and synthetic applications of acetoacetic and malonic esters. #Keto- enol tautomerism of acetoacetic ester#.

UNIT – III

15 hours

PHENOLS

- 3.1. Phenol- Preparation – Dow Process, Physical properties - acidity of phenols, effect of substituents of acidity. Reactions of –OH group – with metallic sodium, FeCl₃, acid chloride and Zinc Dust, Reactions of benzene ring - Halogenation, Nitration, Nitrosation, Sulfonation, Reimer-Tiemann reaction, Kolbe reaction and Gatterman reaction, #uses of phenol#.
- 3.2. **Dihydric Phenols:** Catechol, resorcinol and quinol – preparation, properties and uses.
- 3.3. **Trihydric Phenols:** Pyrogallol and Hydroxyquinol preparation, properties and uses.

UNIT – IV

15 hours

AROMATIC NITRO COMPOUNDS AND AMINES

- 4.1. **Nitro compounds:** Nitrobenzene - Preparation from benzene, Reactions of benzene ring – electrophilic and Nucleophilic substitution, Reactions of Nitro group - reduction of nitrobenzene in neutral, acidic and alkaline medium, uses. TNB & TNT – Preparation and uses.

- 4.2. **Amines:** Physical Properties – Basicity of aromatic amines. Relative characters of aliphatic and aromatic amines, separation mixture of amines – Hinsburg and Hofmann methods. Aniline – **Structure, Preparation, Reactions involving NH₂ group – with acid chlorides, benzaldehyde and K₂Cr₂O₇. Substitution reactions of benzene ring – Halogenation, Sulphonation and Nitration, diazotization and coupling reaction. Uses of amines.** Benzene diazonium chloride and its synthetic applications.
- 4.3. **Sulphonic acids:** Preparation and uses of sulphanilic acid, o-phenylene diamine, sulphanilamide, saccharin, chloramine-T and dichloramine-T.

UNIT – V

15 hours

REAGENTS AND NAMING REACTIONS

- 5.1 **Reagents:** Synthetic applications of Lithium aluminium hydride, Sodium borohydride, Raney nickel, Wilkinson's catalyst, KMnO₄, chromyl chloride, HIO₄, Pb(OAc)₄ and SeO₂.
- 5.2 **Naming reactions:** Aldol, Benzoin, Cannizzaro, Crossed Cannizzaro, Mannich, **Houben - Hoesch reaction**, Michael addition, Perkin and Wolf Kishner reactions with mechanisms.

_____ # Self study

TEXT BOOKS:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year	Units Covered
1	Raj K. Bansal	A Text Book of Organic Chemistry	Revised 4 th Edition	New Age International Publishers, New Delhi	2005	I
2	Bahl and Arun Bahl	Advanced Organic Chemistry	19 th Edition	Sulthan and Chand company, New Delhi	2005	II, III, IV
3	M.K. Jain and S.C. Sharma	Organic Chemistry for B.Sc students of Indian universities	1 st Edition	Vishal Publications	2008	II, III and IV
4	V. K. Ahluwalia	Text book of Organic Chemistry Vol-I & Vol-II	1 st Edition	Ane's Student edition, New Delhi.	2010	II, III and IV
5	O.P. Agarwal	Reactions and Reagents in Organic Chemistry	5 th Edition	Goel Publishing House, Meerut	2005	V

Books for Reference:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year	Units Covered
1	Morrison and Boyd	Organic Chemistry	6 th Edition	Prentice Hall of India Pvt. Ltd., New Delhi	1998	I
2	A.K. Srivastava	Organic Chemistry	1 st Edition	New Age International Publishers, New Delhi	2002	I and II
3	P.L. Soni and H.M. Chawla	Text Book of Organic Chemistry	29 th Edition	Sulthan and Chand company, New Delhi	2012	II, III and IV
4	M. K. Jain	Organic Chemistry	12 th Edition	Sulthan and Chand Company, New Delhi.	2003	II, III and IV
5	Dr. Jagadamba Singh	Undergraduate Organic Chemistry - UGC Curriculum Vol. I & Vol. II	1 st Edition	Pragati Prakashan, Meerut.	2007	V

Web Reference:

<https://slideplayer.com/slide/12672695/>

<https://nptel.ac.in/content/storage2/courses/104103071/pdf/mod6.pdf>

<https://www.slideshare.net/ganeshmote1/phenols-106626111>

<https://www.youtube.com/watch?v=yrYvzst58qw>

<https://nptel.ac.in/courses/104/103/104103023/>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code			Title of the Paper			Hours		Credits	
V	20UCH5CC10			ORGANIC COMPOUNDS CONTAINING O, N & S AND NAME REACTIONS			5		5	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓		✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CO3	✓	✓				✓	✓	✓	✓	
CO4	✓	✓	✓		✓	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches= 43, Relationship : High										

Prepared by:

1. Dr. J. Muneer Ahamath

2. Dr. A. Asrar Ahamed

Checked by: Dr. J. Sirajudeen

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
V	20UCH5CC11	Core – XI	ENERGETICS AND PROPERTIES OF SOLUTIONS	6	5	100	25	75

Course Outcomes (COs):

At the end of the course, students will be able to

- 1: Relate the different thermodynamic functions with nature of the chemical reaction.
- 2: Understand the concepts of entropy and free energy.
- 3: Apply the phase rule to study the behavior of one and two component systems.
- 4: Validate the characteristics of ideal and non-ideal solutions
- 5: Explain the behavior of dilute solutions.

UNIT-I

18 hours

FIRST LAW OF THERMODYNAMICS AND THERMO CHEMISTRY

- 1.1 **Terms used in thermodynamics:** Various systems – open, closed and isolated-homogeneous and heterogeneous- [#]thermodynamic processes-cyclic, isothermal, isochoric, isobaric, adiabatic, reversible and irreversible[#]- Intensive and extensive properties, internal energy, enthalpy, work and heat, state function, path function, exact and inexact differentials, first law of thermodynamics- statement and derivation of its mathematical equation, heat capacity – definition, variation of heat capacity at constant volume and constant pressure, relationship between C_p and C_v , Joule-Thomson effect- statement and applications, Joule Thomson coefficient and inversion temperature- Zeroth law of thermodynamics. (Problems from Joule-Thomson effect)
- 1.2 **Applications of First law:** Calculation of q , W , ΔU and ΔH for isothermal and adiabatic reversible & irreversible expansion of an ideal gas. (Problems)
- 1.3 **Thermo chemistry:** Change of internal energy and change of enthalpy in a chemical reaction, Enthalpy of reaction at constant volume and at constant pressure, Enthalpy of combustion, formation, neutralization, dissociation, solution, hydration, dilution and precipitation. Kirchhoff equation - Hess's law of heat of summation and its application (Problems from Bond energy calculation)

UNIT-II

18 hours

SECOND LAW OF THERMODYNAMICS AND ITS APPLICATIONS

- 2.1. **Second law:** Need for II law, [#]spontaneous process and non-spontaneous process, different statements of second law of thermodynamics [#], heat engine- Carnot's cycle and its efficiency, thermodynamic scale of temperature.
- 2.2. **Entropy:** Definition, entropy as a state function, physical significance of entropy, entropy change in isothermal expansion of ideal gas, entropy change in reversible and irreversible processes, Entropy change accompanying change of phases, entropy of mixture of ideal gases. (Problems from entropy calculation).
- 2.3. **Free energy:** Free energy, work functions, **variation of A and G with T, V and P**, Gibb's–Helmholtz equations and their applications –thermodynamic equations of state- Maxwell's relations – **ΔA and ΔG as criteria for spontaneity and equilibrium. (problems related to free energy)**

UNIT-III

18 hours

THIRD LAW OF THERMODYNAMICS AND PHASE RULE

- 3.1. **Third law:** Need for Third law of thermodynamics - Nernst heat theorem, statement of third law of thermodynamics, Applications of third law- Determination of absolute entropies of solids, Exception of third law.
- 3.2. **Phase Diagrams:** [#]Definition of the terms – Phase, components, degrees of freedom, derivation of Gibbs's phase rule[#], one component system – H_2O , CO_2 and sulphur systems, two component system – Simple eutectic system - Pb-Ag, freezing mixture, compound formation with congruent melting points – $FeCl_3$ - H_2O system, compound formation with incongruent melting points - Na_2SO_4 - H_2O system.

UNIT-IV**18 hours****NON-ELECTROLYTIC SOLUTIONS**

- 4.1. **Solution of liquids in liquids:** [#]Ideal and non-ideal solutions, Raoult's Law and Henry's Law[#], vapour pressure of ideal solution, activity and activity coefficients components in solutions, chemical potential of ideal and non-ideal solution – Gibbs – Duhem - Margules equation.
- 4.2. **Vapour pressure of non-ideal solution:** deviations from Raoult's law, vapour pressure composition and boiling point - composition curves, azeotropic mixtures (HCl-H₂O and C₂H₅OH-H₂O system).
- 4.3. **Solubility of partially miscible liquids pairs:** system with upper CST - Phenol-Water, aniline-hexane, system with lower CST – Triethylamine-water and system with upper and lower CSTs - Nicotine-water, effects of impurities on CST, completely immiscible liquid pairs –Nernst distribution law and its application to solvent extraction.

UNIT-V**18 hours****COLLIGATIVE PROPERTIES OF DILUTE SOLUTIONS**

- 5.1. **Lowering of Vapour Pressure and Osmotic Pressure:** [#]Lowering of vapour pressure, relative lowering of vapour pressure- definitions[#], measurement of lowering of vapour pressure, determination of molecular weight from lowering of vapour pressure. Osmosis and osmotic pressure – definitions, expression for calculating osmotic pressure, determination of molecular weight from osmotic pressure, experimental determination of osmotic pressure, relation between osmotic pressure and lowering of vapour pressure,
- 5.2. **Elevation of boiling point and Depression of freezing point:** Elevation of boiling point- definition, derivation of ebullioscopic constant, determination of elevation of boiling point, determination of molecular weight from elevation of boiling point. Depression of freezing point – definition, derivation of cryoscopic constant, determination of molecular weight from depression of freezing point, experimental determination of depression of freezing point.
- 5.3. Abnormal colligative properties – Association, dissociation, Van't Hoff factor, degree of association and degree of dissociation (Problems from 5.1 and 5.2).

_____ # Self Study

TEXT BOOKS:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year	Units Covered
1.	B. R. Puri, L. R. Sharma and M.S. Pathania	Principles of Physical Chemistry	48 th Edition	Vishal Publications, Jalandhar	2019	I, II, III, IV & V
2.	K. Kuriacose and J. C. Rajaramn	Thermodynamics for Students of Chemistry	Revised Edition	S. Chand & Co., New Delhi	2002	I & II
3.	R.L. Madan and G.D. Tuli	Simplified Course in Physical Chemistry	5 th Revised and Enlarged Edition	S. Chand & Co., New Delhi,	2009	I, II, III, IV & V

Books for Reference:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year	Units Covered
1	Samuel Glasstone	Thermodynamics for Chemists	2 nd Edition- Reprint	East-West Edition, New Delhi	2018	I and II
2	Peter Atkins and Julio de Paula	Elements of Physical Chemistry	7 th Edition	Oxford Press, New Delhi	2017	I, II, III, IV and V
3	J. N. Gurtu and A. Gurtu	Advanced Physical Chemistry	Revised 4 th Edition	Pragathi Prakashan, Meerut	2009	I, II and III
4	B. S. Bahl, G. D. Tuli and Arun Bahl	Essentials of Physical Chemistry	28 th Edition	S. Chand & Co., New Delhi	2020	I, II, III, IV and V

5	N. Kundu and S. K. Jain	Physical Chemistry	Revised Edition	S. Chand & Co., New Delhi	2000	I, II, III, IV and V
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Web Reference: Unit: I, II and III (3.1)– https://swayam.gov.in/nd1_noc19_cy32/...

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code			Title of the Paper			Hours		Credits	
V	20UCH5CC11			ENERGETICS AND PROPERTIES OF SOLUTIONS			6		5	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓		✓	✓	✓	✓	
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓		✓	✓	✓	✓	
CO4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓		✓	✓	✓	✓	
Number of Matches= 44, Relationship : High										

Prepared by:

1. Dr. A. Jafar Ahamed
2. Dr. M. Syed Ali Padusha
3. Dr. M. Anwar Sathiq

Checked by: Dr. M. Seeni Mubarak

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

SEMESTER	Code	Course	Title of the Course	Hours	Credits	Max. Marks	Internal marks	External marks
V	20UCH5CC12P	Core-XII	PHYSICAL CHEMISTRY ELECTRICAL - PRACTICAL	4	4	100	20	80

Course Outcomes (COs):

At the end of the course, students will be able to

- 1: Apply the principle of conductometric titrations.
- 2: Understand the concept of potentiometry.
- 3: Analyze the different types of chemical reaction.
- 4: Evaluate electrode potential of the single electrode.
- 5: Determine electro motive force (EMF) of a chemical reaction.

List of Practicals:

Conductometry

1. Determination of strength of strong acid by conductometry. (HCl Vs NaOH)
2. Determination of strength of a weak base by conductometry. (CH₃COONH₄)
3. Determination of strength of K₂SO₄ by conductometry. (BaCl₂ Vs K₂SO₄)
4. Determination of equivalent conductance of a strong electrolyte. (KCl)

Potentiometry

5. Determination of strength of a strong acid by potentiometry. (HCl Vs NaOH)
6. Determination of strength of weak acid by potentiometry. (CH₃COOH)
7. Determination of pH of a buffer solution by potentiometry. (CH₃COOH + CH₃COONa)
8. Determination of strength of Fe (II) ion by potentiometry. (FeSO₄ Vs K₂Cr₂O₇)

Scheme of valuation

Record	-	10 marks
Procedure writing with Formula	-	10 marks
Experiment	-	60marks
<2%	-	60 marks
2-3 %	-	50 marks
3-4%	-	40 marks
>4 %	-	20 marks

Books for Reference:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year
1	Findlay A	Practical Physical Chemistry	7 th edition	London, Longman	1959
2	Daniels	Experimental Physical Chemistry	7 th edition	New York, McGraw Hill	1970
3	Venkateswaran V. Veerasamy R. Kulandaivelu A.R	Basic principles of Practical Chemistry	2 nd edition	S. Chand & Co Pvt. Ltd, New Delhi	1997
4	Garland, C. W.; Nibler, J. W. & Shoemaker, D. P	Experiments in Physical Chemistry	8 th edition	McGraw-Hill: New York (2003)	2003
5	Halpern, A. M. & McBane, G. C	Experimental Physical Chemistry	3 rd edition	W.H.Freeman & Co., New York (2003). 4.	2003

Web Reference: <https://vlab.amrita.edu/index.php?sub=2&brch=190&sim=361&cnt=1>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester		Code				Title of the Paper			Hours	Credits
V		20UCH5CC12P				PHYSICAL CHEMISTRY ELECTRICAL - PRACTICAL			4	4
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓		✓	✓			
CO2	✓	✓	✓	✓		✓	✓			
CO3	✓	✓	✓			✓	✓		✓	
CO4				✓	✓	✓	✓	✓	✓	✓
CO5	✓	✓			✓	✓	✓	✓	✓	
Number of Matches = 32, Relationship : Moderate										

Prepared by:

1. Dr. S. K. Periyasamy
2. Mr. M. Varusai Mohamed

Checked by:

Dr. M. Purushothaman

Note: Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

SEMESTER	Code	Course	Title of the Course	Hours	Credits	Max. Marks	Internal marks	External marks
V	20UCH5DE1AP	DSE-I	PREPARATION AND ANALYSIS OF ORGANIC COMPOUNDS-PRACTICAL	5	4	100	20	80

Course Outcomes (COs):

At the end of the course, students will be able to

- 1: Synthesise selected organic compounds independently.
- 2: Analyse the nature and special elements present in an organic compound.
- 3: Differentiate the aliphatic and aromatic nature of the organic compounds.
- 4: Identify the functional group through systematic chemical analysis
- 5: Report the analysis of organic compound

List of Practicals:

(i) Preparation of organic compounds involving the following chemical conversions

1. Oxidation (Benzoic acid from benzaldehyde)
2. Hydrolysis (Benzoic acid from ethyl benzoate)
3. Nitration (*m*-Dinitrobenzene from nitrobenzene)
4. Bromination (*p*-Bromoacetanilide from acetanilide, Tri-bromoaniline from aniline)
5. Diazotization (Methylorange from aniline)

(ii) Analysis of Organic compounds Practical:

(a) Characterization of functional groups

(b) Confirmation by preparation of solid derivatives / characteristic colour reactions.

Note: Mono-functional compounds are given for analysis. In case of **bi-functional** compounds, students are required to report any one of the functional groups.

(iii) *insilico* Spectral data Analysis of organic compounds using chemDraw 20.X:

Draw the chemical structure and determination of ^1H , ^{13}C chemical shift values and molecular mass

Scheme of valuation

	Record	-	10 marks
	Procedure writing	-	10 marks
(i)	Organic Preparation	-	15 marks
(ii)	Organic analysis	-	35 mark
	Special elements present / absent	-	05 marks
	Aromatic/ aliphatic	-	05 marks
	Saturated/ unsaturated	-	05 marks
	Functional group present	-	15 marks
	Derivative	-	05 marks
	(iii) <i>Insilico</i> analysis	-	10 marks
	Structure and molecular mass	-	04 marks
	Chemical shift values	-	06 marks

Books for Reference:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year
1	Venkateswaran V. Veerasamy R. Kulandaivelu A.R	Basic principles of Practical Chemistry	2 nd edition	S. Chand & Co Pvt. Ltd, New Delhi	1997
2	Furniss, B.S.; Hannaford, A.J.; Smith, P.W.G.; Tatchell, A.R.	Practical Organic Chemistry,	5 th edition	Pearson PVT .Ltd	2012

Web Reference:

<https://vlab.amrita.edu/index.php?sub=2&brch=191>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester		Code				Title of the Paper			Hours	Credits
V		20UCH5DE1AP				PREPARATION AND ANALYSIS OF ORGANIC COMPOUNDS - PRACTICAL			5	4
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓			✓	✓	✓	
CO2	✓		✓	✓	✓	✓	✓		✓	
CO3	✓		✓	✓		✓	✓	✓		
CO4	✓			✓	✓	✓	✓	✓	✓	
CO5	✓		✓			✓	✓		✓	
Number of Matches = 32, Relationship : Moderate										

Prepared by:

1. Dr. S. Mohamed Rabeek
2. Mr. M. Varusai Mohamed

Checked by:

Dr. M. Purushothaman

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. Marks	Internal Marks	External Marks
V	20UCH5DE1BP	DSE-I	QUANTITATIVE ANALYSIS BY PHOTOMETRIC METHOD - PRACTICAL	5	4	100	20	80

Course out comes (COs):

At the end of the course, students will be able to

- 1: Apply the concept of photometry to metal complex
- 2: correlate the intensity of colour of a solution with variation in concentration
- 3: Analyse optical density of a solution by varying concentration
- 4: Assess the metal ligand ratio of complex by Job's Method
- 5: Interpret the quantification of the complex

QUANTITATIVE ANALYSIS BY SPECTROPHOTOMETRIC METHOD

1. Ni as nickel dimethyl glyoxime
2. Zn as zinc oxinate
3. Pb as lead chromate
4. Ba as barium chromate
5. Copper –EDTA Complex
6. Cobalt –Hydrazinate complex
7. Zinc – EDTA Complex
8. Chloro Cuprate complex

Scheme of valuation

Procedure writing	-	10 marks
Record	-	10 marks
Experiment	-	60 Marks

<5%	-	60 marks
5-10%	-	50 marks
11-20%	-	30 marks
>20 %	-	20 marks

Books for Reference:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year	Units Covered
1.	Bidhan Chandra Ray and Satyanarayan Das,	A text book on Chemistry Practical	2 nd Edition	New central book agency pvt ltd, Kolkata,	2014	All

Web Reference:

http://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S000005CH/P000658/M026165/ET/1515586346CHE_P3_M15_etext.pdf

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Paper				Hours		Credits	
V	20UCH5DE1BP		QUANTITATIVE ANALYSIS BY PHOTOMETRIC METHOD - PRACTICAL				5		4	
Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific outcomes(PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓				✓	✓	✓		
CO2	✓	✓	✓	✓		✓	✓	✓		
CO3	✓	✓	✓	✓		✓	✓	✓		
CO4		✓			✓		✓			
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Number of Matches=31					Relationship : Moderate					

Prepared by:

1. Dr. S. K. Periyasamy
2. Mr. M. Varusai Mohamed

Checked by:

Dr. M. Purushothaman

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. Marks	Internal Marks	External Marks
V	20UCH5SE2A	SEC-II	ANALYTICAL TECHNIQUES	2	2	100	-	100

Course Outcomes (COs):

At the end of the course, students will be able to

1. Demonstrate the procedures of first-aid techniques
2. Classify the types of precipitations
3. Analyze the thermal stability of the compounds
4. Explain the principle and techniques of separation
5. Understand the features and significances of Intellectual Property Rights

UNIT – I

6 hours

LABORATORY HYGIENE AND SAFETY

1.1 Storage and handling of chemicals-handling of toxic and poisonous chemicals, General precautions, first aid techniques - acid and alkali on eye - acid and alkali burn - bromine burns - cut by glasses - heat burns - Inhalation of toxic vapours.

1.2 Poisoning - Treatment for specific poisons - acids, alkalis, acetone, arsenic and copper Compounds, cyanides –[#] antidote – definition - universal antidotes[#].

UNIT – II

6 hours

GRAVIMETRIC ANALYSIS

2.1. Precipitation – Methods of obtaining the precipitate- condition of precipitate - choice of precipitants- organic Precipitants - Types of organic precipitants - chelating and ion associating precipitants - Advantages and Disadvantages of using organic precipitants.

2.2. Specific and selective precipitants - Theories of precipitation-process of crystal growth. Co-precipitation and post-precipitation-precipitation from homogeneous solution-digestion, filtration and washing-drying and ignition.

UNIT – III

6 hours

THERMAL ANALYSIS

3.1. Thermo gravimetric Analysis (TGA)-principle instrumentation techniques - Factors affecting TGA – Applications – TGA curves of AgNO_3 and $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$.

3.2. Differential Thermal Analysis (DTA)- Principle – instrumentation techniques– Factors affecting DTA curves – Applications- DTA curve of $\text{Ca C}_2\text{O}_4 \cdot \text{H}_2\text{O}$.

UNIT – IV

6 hours

CHROMATOGRAPHY

4.1. [#]Chromatography – Classification[#]-Paper chromatography – principle, types, techniques and applications. TLC - principle, techniques and applications.

4.2. Column chromatography- Principle, types, techniques and applications - HPLC and Gas chromatography – principle – instrumentation – techniques and applications

UNIT – V

6 hours

INTELLECTUAL PROPERTY RIGHTS

5.1. Introduction to IPRs, Basic concepts and need for Intellectual Property – Patents, Copyrights, Geographical Indications, IPR in India and Abroad – Genesis and Development – the way from WTO to WIPO –TRIPS

5.2. Nature of Intellectual Property, Industrial Property, technological Research, Inventions and Innovations – Important examples of IPR.

#_____# Self study

Text Books:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year	Units Covered
1.	S.M.Khopkar	Basic concepts of analytical chemistry	2 nd Edition	New Age International Limited, New Delhi	2004	I,II III
2.	Dhruba Charan Das	Analytical Chemistry	1 st Edition	PHI learning private limited, New Delhi.	2011	II-V
3.	R. Gopalan, P.S. Subramanian & K.Rengarajan	Elements of analytical chemistry	1 st Edition	S. Chand publishing, New Delhi	2003	IV,V

Books for Reference:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year	Units Covered
1.	B.K. Sharma	Instrumental methods of chemical analysis	23 rd Edition	Geol Publications, Meerut	2004	III, IV, V
2.	H. Kaur	Instrumental methods of Chemical Analysis	1 st Edition	Pragathi Prakasan Publications, Meerut.	2012	III, IV, V
3.	A.K. Srivastava &P.C. Jain	Instrumental approach to Chemical Analysis	4 th Edition	S. Chand & Company, New Delhi	2005	III, IV, V

Web Reference:

<https://nptel.ac.in/courses/104/106/104106121/>

<https://nptel.ac.in/content/storage2/courses/102103044/pdf/mod5.pdf>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
V	20UCH5SE2A		Analytical Techniques			2			2	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓		✓	✓	✓	✓	✓	✓		✓
CO2	✓	✓	✓	✓		✓	✓	✓	✓	
CO3	✓	✓	✓	✓			✓	✓	✓	
CO4		✓	✓	✓			✓	✓	✓	
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of matches = 39 (78%) , Relationship: High										

Prepared by:
Dr. F. M. Mashood Ahamed

Checked by:
Dr. A. Zahir Hussain

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. Marks	Internal Marks	External Marks
V	20UCH5SE2B	SEC -II	ELECTROANALYTICAL TECHNIQUES	2	2	100	-	100

Course Outcomes (COs):

At the end of the course, students will be able to

- 1: Explain the principle of Polarography
- 2: Understand the concept of potentiometric measurements
- 3: Gain experimental skills on amperometric titrations.
- 4: Understand the coulometric analysis.
- 5: Apply the electrolytic separation of metals.

UNIT – I

6 hours

POLAROGRAPHY

- 1.1. Polarography- Principle, Instrumentation, Applications – qualitative and quantitative analysis, polarographic measurements, polarographic waves- half wave potential –reversible waves – irreversible waves- significance
- 1.2. Currents contributing to the polarographic waves - migration current. Residual current, kinetic current, and diffusion current-Ilkovic equation and its importance. #Dropping mercury electrode-advantages and disadvantages#.

UNIT – II

6 hours

POTENTIOMETRY

- 2.1. Potentiometer- principle -Ion selective membrane electrode-liquid membrane electrode-double membrane electrode-characteristics-Applications
- 2.2. Potentiometric titrations- principle, advantages - potentiometric titrations- types of potentiometric titrations- redox, neutralization, precipitation, complexometric, differential and automatic titration.

UNIT – III

6 hours

AMPEROMETRY

- 3.1. Amperometry- principle, amperometric titration curves, amperometric indicators, instrumentation, techniques for amperometric titrations, advantages and disadvantages. Applications of amperometry titration.
- 3.2. Biamperometric titrations- theory, - Instrumentation, Techniques, advantages and applications.

UNIT –IV

6 hours

COULOMETRY

- 4.1 Coulometry- principle, current measuring device hydrogen oxygen coulometer, silvercoulometer. and iodine coulometer.
- 4.2 Coulometric titrations – Principle, instrumentation-#applications#.

UNIT – V

6 hours

ELECTROGRAVIMETRY

- 5.1. Electrogravimetry- theory, important terms used in electrogravimetric analysis- voltaic and electrolytic cells, cathode, anode, polarized electrode, current density, current efficiency, decomposition potential and over potential -advantages.
- 5.2 Electrogravimetric methods, instrumentation- electrolysis- principle - Determination of Cu and Co by constant current electrolysis.

#___# Self Study

TEXT BOOKS:

S.No .	Author Name	Book Name	Edition	Publisher Detail	Year	Units Covered
1.	R. Gopalan, P. S. Subramanian, K. Rangarajan	Elements of Analytical Chemistry	2 nd Edition	Sultan Chand and Sons	1995	I, II & III
2.	S. M.Khopkar	Basic Concept of Analytical Chemistry	3 rd Edition	Wiley Eastern Ltd	1998	I, II & III
3	H. Kaur	Instrumental Methods of Chemical Analysis	7 th Edition	Pragathi prakasan	2018	IV & V

Books for Reference:

S.No.	Author Name	Book Name	Edition	Publisher Detail	Year	Units Covered
1.	B. K. Sharma	Instrumental methods of Analysis	Reprint	Krishna Prakashan Media	2012	I, II & III
2.	A. K. Srivastava P. C. Jain	Instrumental approach to Chemical Analysis	4 th Edition	S. Chand Publications	2009	IV & V

Web Reference:

- <https://ebooks.schandpublishing.com>
- <https://www.britannica.com/science/chemical-analysis/Electroanalysis>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Paper							Hours	Credits	
V	20UCH5SE2B	ELECTRO ANALYTICAL TECHNIQUES							2	2	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
	CO1	✓	✓	✓			✓			✓	✓
	CO2	✓	✓		✓	✓	✓	✓	✓		
	CO3	✓		✓			✓	✓			
	CO4	✓	✓	✓			✓		✓	✓	✓
	CO5	✓	✓	✓	✓		✓	✓	✓		✓
Number of Matches= 33, Relationship : Moderate											

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very high

Prepared by: Dr. M. Yaseen Mowlana

Checked by: Dr. A. Zahir Hussain

Semester	Code	Course	Title of the Course	Hours	Credits	Max. Marks	Internal Marks	External Marks
V	20UCH5SE3A	SEC-III	CLINICAL CHEMISTRY	2	2	100	--	100

Course outcome (COs):

At the end of the course, students will be able to

- 1: Understand the basic knowledge on drugs and its applications
- 2: Explain the structure of Antibiotics and uses
- 3: Categorize the Anesthetics and Analgesics
- 4: Predict the blood composition, mechanism and coagulants
- 5: Understand the applications of nanomaterials in medicine

UNIT-I

6 hours

DRUGS TERMINOLOGY

- 1.1. **Drugs**—Definition-source of drugs-important terminologies – pharmacy-chemotherapy- Pharmacology – pharmacodynamics – **pharmacophore** - **pharmacognosy** -**pharmacopoeia** – metabolites – antimetabolites –virus– bacteria -fungi.
- 1.2. **Common diseases**- Tuberculosis – asthma - jaundice, leprosy and typhoid -causes, symptoms, prevention and treatment.

UNIT-II

6 hours

ANTIBIOTICS

- 2.1. **Antibiotics**—Definition - penicillin and streptomycin. chloramphenicol, ampicillin, Tetracycline and erythromycin –structure and uses.
- 2.2. **Sulpha drugs** – Definition - sulphadiazine, sulphapyridine, sulphathiazole and sulphafurazole - preparation and uses.

UNIT-III

6 hours

ANASTHETICS AND ANALGESICS

- 3.1. **Anesthetics** – Definition – classification - general volatile anaesthetics - ethers, nitrous oxide, chloroform, halothane - advantages and disadvantages. Intravenous anaesthetics – thiopental sodium, methohexitone - local anaesthetics - cocaine, procaine, benzocaine- advantages-disadvantages
- 3.2. **Analgesics**-Definition- classification- narcotics analgesics and non-narcotics analgesics- morphine, heroin, methadone, aspirin, [#]methyl salicylate- structure and uses[#].

UNIT-IV

Blood and Anaemia

6 hours

- 4.1. **Blood**—definition – composition-blood grouping-Rh factor-clotting of blood – mechanism-coagulants-vitamin K and protamin sulphate –anticoagulants- coumarine and heparin.
- 4.2. **Anaemia**– symptoms and causes – types of anaemia – [#]antianaemic drugs[#].

UNIT-V

6 hours

Applications of Nanomaterials

- 5.1. Nano pharmacology –Drug carriers – nano capsules – nano medicine and therapeutics.
- 5.2. Application of nano robots in medicine – cosmetics and consumer need – sunscreen – personal care products – antiaging products - textiles – paints – defence.

[#]___[#] Self study

Text books:

S.No.	AuthorName	Book Name	Edition	Publisher Detail	Year	Units Covered
1.	Mathew George and Lincy joseph	Textbook of pharmaceutical chemistry	Revised Edition	Viva book private Ltd New Delhi	2009	I, II & III
2.	Jayashree Ghose	Textbook of Pharmaceutical chemistry	2 nd Edition	S.Chand & Co., New Delhi	2003	I, II & III
3.	Lakshmi.S	Pharmaceutical Chemistry	3 rd Edition	S.Chand & Co., New Delhi	2004	I-IV
4.	Sulabha K. Kulkarni	Nanotechnology: Principles and practices	Revised Edition	Capital Pvt. Co, New Delhi	2002	V
5.	B S Murty, P. Shankar, Baldev Raj, B B Rath and James Murdy	Text book of Nanoscience and Nanotechnology	Revised Edition	Universities Press Pvt. Ltd, Hyderabad.	2013	V

Reference Books:

S. No.	AuthorName	Book Name	Edition	Publisher Detail	Year	Units Covered
1.	D.Sriram and P.Yogeshwari	Medicinal Chemistry	2 nd Edition	Sharma Printers, Delhi	2011	I
2.	Ashutoshkar	Medicinal chemistry	Revised edition	International Publishers	2010	I, II & III
3.	V.N. Rajasekaran	Pharmaceutical Chemistry	4 th Edition	Sunpublications Chennai	2003	III & IV
4.	G. Mohan Kumar	Nanotechnology, Nanomaterials and Nano devices	1 st Edition	Narosa Publishing House Pvt Ltd, New Delhi	2016	V

Web Reference: <https://www.worldcat.org>
<https://www.accessdata.fda.gov>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code			Title of the Paper			Hours		Credits	
V	20UCH5SE3A			CLINICAL CHEMISTRY			2		2	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓			✓	✓	✓	✓	
CO2	✓	✓	✓			✓	✓	✓		✓
CO3	✓	✓		✓		✓	✓	✓		
CO4	✓	✓	✓		✓	✓	✓	✓		✓
CO5	✓	✓	✓	✓		✓	✓		✓	✓
Number of Matches= 36, Relationship : High										

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Prepared by: Dr. H. Mohamed Kasim Sheit

Checked by: A. Zahir Hussain

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
V	20UCH5SE3B	SEC-III	WATER QUALITY ANALYSIS	2	2	100	-	100

Course Outcomes (COs):

At the end of the course, students will be able to

- 1: Realize the water pollution on environment.
- 2: Identify the sources and harmful effects of marine and ground water pollution.
- 3: Create the knowledge about water quality parameters.
- 4: Predict sources and effects of trace elements.
- 5: Apply the various techniques for waste water treatment.

UNIT-I

6 hours

Water Pollution

- 1.1. Water pollution – Definition– Classification of water pollutants – Organic wastes – Oxygen demanding wastes – Disease causing wastes – Sewage – Harmful effects.
- 1.2. Inorganic water pollutants – Suspended solids – Sediments – Radioactive materials - Harmful effects.

UNIT-II

6 hours

Types of Water Pollution

- 2.1. Marine pollution - Definition – Sources - Harmful effects of marine pollution – Control methods.
- 2.2. Groundwater pollution - Definition – Sources - Harmful effects – Control methods – Eutrophication – Effects - Control methods.

UNIT-III

6 hours

Water Quality Parameters

- 3.1. Water quality parameters –Significance – Determination of pH, total hardness, TDS, Chloride, Fluoride, BOD, COD and DO.
- 3.2. Water quality standards– WHO, ICMR and [#]BIS -comparison[#]

UNIT-IV

6 hours

Trace Elements and impacts

- 4.1. Trace elements- Definition – Mechanism of distribution – Primary, secondary and tertiary dispersion – Essential and non essential trace elements – Physiological role of trace elements.
- 4.2. Cu, Pb, Cd, Hg, Cr, Zn, As-Industrial uses - pollution sources- harmful effects and Control methods

UNIT-V

6 hours

Water Treatment Process

- 5.1. Waste water treatment – Preliminary treatment – Objectives – Primary treatment – Sedimentation method –coagulations- neutralization
- 5.2. Secondary treatment – Objectives – Trickling filter method – Activated sludge process – oxidation pond-[#]sludge treatment and disposal[#].

[#]Self study

Text Books:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year	Units Covered
1.	S. S. Dara & D. D. Mishra	A Text Book of Environmental Chemistry and Pollution Control (Energy, Ecology, Ethics and Society)	9 th Edition	S. Chand & Company, New Delhi	2011	I - V

Books for Reference:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year	Units Covered
1.	B.K. Sharma	Water Pollution	4 th Edition	Goel Publishing House, Meerut	2005	I - V
2.	H.Kaur	Environmental Chemistry	10 th Edition	Pragati Prakashan Publishers, Meerut	2016	I - V

Web Reference:

- <https://www.farookcollege.ac.in/certificate-course-in-water-quality-assessment>
- <https://www.ysi.com/parameters>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code			Title of the Paper			Hours		Credits	
V	20UCH5SE3B			WATER QUALITY ANALYSIS			2		2	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓			✓	✓	✓	✓	
CO2	✓	✓	✓	✓	✓	✓	✓	✓		✓
CO3	✓	✓		✓		✓	✓	✓		
CO4	✓	✓	✓		✓	✓	✓	✓		✓
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches= 40, Relationship : High										

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Prepared by:
Dr. R. Abdul Vahith

Checked by:
Dr. A. Zahir Hussain

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
VI	20UCH6CC13	Core -XIII	CHEMISTRY OF d, f- BLOCK ELEMENTS AND METAL COMPLEXES	5	5	100	25	75

Course Outcomes (COs):

At the end of the course, students will be able to

- 1: Describe the chemistry of transition elements
- 2: Understand inner transition elements
- 3: Compute CFSE of Coordination Compounds
- 4: Know the types of isomerism and the stability of complexes
- 5: Apply the principles of coordination chemistry in qualitative and quantitative analyses.

UNIT – I

15 hours

TRANSITION ELEMENTS AND THEIR PROPERTIES

- 1.1 **Transition Elements:** General characteristics – electronic configuration, variable oxidation states, tendency to form complexes, standard electrode potential, colour, magnetic properties and catalytic properties.
- 1.2 Preparation, properties and uses of TiO_2 , V_2O_5 , Cr_2O_3 , MnO_2 , CoO and NiO .
- 1.3 **Platinum Triads** - Ruthenium, rhodium, palladium, osmium, iridium and platinum - properties and uses

UNIT – II

15 hours

INNER-TRANSITION ELEMENTS AND SOME SPECIAL COMPOUNDS

- 2.1 **Lanthanides:** Properties of lanthanides - electronic configurations - oxidation states, ionic radii - lanthanide contraction – colour - magnetic properties - separation of lanthanides - **ion-exchange method**.
- 2.2 **Actinides:** Actinide contraction – Trans-uranium elements – Properties, oxidation states, colour of ions, formation of complexes, comparison with lanthanides.
- 2.3 **Some special compounds** - **Carboranes** – **Closo and nido carboranes** - Preparation, properties and structure. **Intercalation compounds of graphite** – with alkali metals, **oxoacids, metal halides and halogens**. Zeolite and ultramarine – composition, structure and uses. Clathrates – characteristics and uses

UNIT – III

15 hours

COORDINATION CHEMISTRY

- 3.1 **Coordination compounds:** Definition, **terminology**, Ligands – classification - based on charge and denticity. **Hapticity**. IUPAC nomenclature.
- 3.2 **Theories of coordination compounds:** [#]Werner's theory[#], Sidgwick and Pauling's theory, limitations of Pauling's theory. Crystal field theory – splitting of d-orbitals in O_h , T_d and square planar complexes – CFSE of weak and strong fields – **Colour of transition metal complexes** - **visible absorption spectrum of $\text{Ti}(\text{H}_2\text{O})_6^{3+}$** .
- 3.2 **Organometallic compounds** - alkene complex - **Zeise's salt**, alkyne complex - **$[\text{Co}_2(\text{CO})_6(\text{RC}\equiv\text{CR})]$** , metallocene - **ferrocene** - preparation, properties and structure.

UNIT – IV**15 hours****ISOMERISM AND STABILITY OF COMPLEXES**

- 4.1 **Isomerism in coordination compounds:** Structural isomerism - ionisation, hydrate, ligand, linkage, coordination and coordination position isomerisms; Stereoisomerism – Geometrical and optical isomerism in 4 and 6 coordination compounds – #Distinction between cis and trans-isomers#.
- 4.2 **Stability of complexes in aqueous solution:** Thermodynamic stability - stable and unstable complexes, kinetic stability – labile and inert complexes. Stepwise and overall stability constants.
- 4.3 **Substitution reaction-** SN^1 and SN^2 Reactions in Oh complexes. Square planar complexes - Trans effect - definition and its applications.
- 4.4 **Chelates** – Characteristics – classification – factors influencing the stability of metal chelates.

UNIT – V**15 hours****CARBONYLS AND NITROSYLS**

- 5.1 **Metal carbonyls:** Preparation, properties and structures of mono and binuclear carbonyls of Cr, Mn, Fe, Co and Ni - Applications of $18 e^-$ and EAN rules on metal carbonyls.
- 5.2 **Nitrosyls:** Classification, Sodium nitroprusside – Preparation, properties and uses.
- 5.3 **Analytical application of coordination complexes** – Detection of K^+ ions – Separation of Cu^{2+} and Cd^{2+} ions – Estimation of Ni^{2+} using DMG and Al^{3+} using oxine. Structure of EDTA and its complexes – applications.
- 5.4 **Biologically important coordination compounds** - Chlorophyll, Haemoglobin, Vitamin B_{12} - structure and function.

_____ # Self Study

TEXTBOOKS:

S. No.	Author Name	Book Name	Edition	Publisher Detail	Year	Units Covered
1.	P.L. Soni, Mohan Katyal	Textbook of Inorganic Chemistry	Revised Edition	Sulthan Chand & Sons, New Delhi	2013	I, II, III, IV, V
2.	Wahid Malik, G.D.Tuli and R.D.Madan	Selected Topics in Inorganic Chemistry	Revised Edition	S. Chand & Co, New Delhi	2010	I, II, III, IV, V
3.	Satya Prakash, G.D. Tuli, S.K. Basu, R.D. Madan	Advanced Inorganic Chemistry, Vol-II	19 th Edition	S Chand & Co Ltd, New Delhi	2011	I, II, III, IV, V
4.	R. Gopalan, V. Ramalingam	Concise Coordination Chemistry	1 st Edition	Vikas Publishing House Pvt. Ltd	2001	III, IV, V
5.	Ajai Kumar , Mukesh Chand , Sudershan Kumar	Advanced Inorganic Chemistry	1 st Edition	Aaryush Education, UP	2018	I, II, III, IV, V

Books for Reference:

S. No.	Author Name	Book Name	Edition	Publisher Detail	Year	Units Covered
1.	B.R. Puri, L.R.Sharma and K.C.Kalia	Principles of Inorganic chemistry	33 rd Edition	Vishal Publishing Co, New Delhi	2020	I, II, II, IV, V
2.	Gurdeep Raj	Advanced Inorganic Chemistry-Vol.-I	Revised Edition	Krishna Prakashan Media (P) Ltd	2014	I, II, II, IV, V
3.	Gurdeep Raj	Advanced Inorganic Chemistry-Vol.-II	Revised Edition	Krishna Prakashan Media (P) Ltd	2014	I, II, II, IV, V
4.	J.D. Lee	Concise Inorganic Chemistry	5 th Edition	Blackwell Science Ltd., France	2014	I, II
5.	James E Huheey, E.A.Keiter, R.L.Keiter	Inorganic Chemistry: Principles of Structure and Reactivity	4 th Edition	Pearson Education	2014	III, IV, V

Web Reference: Unit: III & IV <https://nptel.ac.in/noc/courses/noc19/SEM2/noc19-cy19/>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Paper			Hours		Credits		
VI	20UCH6CC13		CHEMISTRY OF d, f- BLOCK ELEMENTS AND METAL COMPLEXES			5		5		
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓		✓	✓	✓	✓	
CO2	✓	✓	✓		✓	✓		✓	✓	✓
CO3	✓			✓		✓	✓	✓		✓
CO4	✓	✓	✓		✓	✓	✓		✓	✓
CO5	✓	✓	✓			✓	✓	✓	✓	✓
Number of Matches= 38, Relationship : High										

Prepared by:

1. Dr. K. Loganathan
2. Dr. N. Mujafarkani

Checked by: Dr. A. Jamal Abdul Nasser

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
VI	20UCH6CC14	Core – XIV	STEREOCHEMISTRY, MOLECULAR REARRANGEMENTS AND NATURAL PRODUCTS	5	5	100	25	75

Course Outcomes (COs):

At the end of the course, students will be able to

- 1: Acquire the comprehensive knowledge on stereochemistry
- 2: Understand the concepts of isomerism and conformational analysis
- 3: Apply the mechanism for various molecular rearrangements
- 4: Know the importance of organic photochemistry and pericyclic reactions
- 5: Elucidate the structure of terpenes and alkaloids

UNIT – I

15 hours

STEREOCHEMISTRY – I

- 1.1. Isomerism – Definition, classification, Optical isomerism, optical activity, conditions for optical activity, asymmetric centre. Definition of Chirality and prochirality.
- 1.2. [#]Optical activity of lactic acid and tartaric acid[#] - enantiomers and diastereomers, racemic mixture – resolution – chemical and biochemical resolutions. Racemization, asymmetric synthesis and Walden inversion.
- 1.3 Optical activity of compounds containing no asymmetric carbons – Biphenyls, allenes and spiranes.

UNIT – II

15 hours

STEREOCHEMISTRY - II

- 2.1 D,L-Configuration, R,S-Notations – Cahn, Ingold and Prelog rule, Erythro and Threo representations. Fischer, Sawhorse and Newmann projection formulae of compounds containing two asymmetric carbon atoms.
- 2.2 Geometrical Isomerism: Cis-trans, syn-anti and E-Z notations, [#]Geometrical isomerisms of Maleic and Fumaric acids[#] and unsymmetrical ketoximes, methods of determination of the configuration of geometrical isomers.
- 2.3 Conformational analysis – Definition, conformations of ethane and n-butane and their stability. Conformations of cyclohexane and energy profile diagram.

UNIT – III

15 hours

MOLECULAR REARRANGEMENTS

- 3.1. **Carbocation rearrangements:** Pinacole-Pinacolone, Dienone-phenol and Wolff rearrangements with mechanisms.
- 3.2. **Rearrangements to electron-deficient nitrogen:** Beckmann, Hofmann and Curtius rearrangements with mechanisms.
- 3.3 **Rearrangements to electron-deficient oxygen:** **Bayer-Villiger**, Benzilic acid and Favorskii rearrangements with mechanisms.
- 3.4 **Aromatic rearrangements:** Benzidine, Fries and Claisen rearrangements with mechanisms.

UNIT – IV

15 hours

ORGANIC PHOTOCHEMISTRY AND PERICYCLIC REACTIONS

- 4.1 **Organic Photochemistry: Laws of photochemistry - Jablonski diagram – Quantum**

efficiency – Experimental determination of Quantum yield - Photochemistry of alkenes – Rearrangement of 1,4-Diene - Norrish type I & II reactions - Paterno Buchi reaction - Barton reaction – Photochemical formation of smog.

- 4.2. **Pericyclic Reactions: Definitions**, Salient features of concerted reactions - electrocyclic, cycloaddition and sigmatropic (elementary ideas only), Orbital symmetry properties, Woodward Hoffman rules - correlation diagram (1,3 butadiene - cyclobutene), sigmatropic rearrangements - 1,3 and 1,5 - hydrogen shifts.

UNIT – V

15 hours

ALKALOIDS AND TERPENOIDS

5.1 **Alkaloids:** Classification – General methods of isolation, Hofmann exhaustive methylation, Structural elucidation of coniine, nicotine and piperine.

5.2 **Terpenoids:** #Classification, Isoprene rule#, special isoprene rule, gem - dialkyl rule, Structural elucidation and uses of citral, α -terpineol and menthol.

#_____# **Self – Study**

TEXT BOOKS:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year	Units Covered
1	D. Nasipuri	Stereochemistry of Organic Compounds Vol-I & Vol-II	3 rd Edition	New Age International (P) Ltd, Publishers, New Delhi.	2010	I and II
2	P.L. Soni and H.M. Chawla	Text Book of Organic Chemistry	29 th Edition	Sulthan and Chand company, New Delhi	2012	II
3	Dr. Jagadamba Singh	Undergraduate Organic Chemistry -UGC Curriculum Vol. I & Vol. II	1 st Edition	Pragati Prakashan, Meerut.	2007	III
4.	K.S. Mukherjee	Mechanism of Organic Reactions	Revised 2 nd Edition	Arunabha Sen, Books & Allied (P) Ltd, Kolkata	2015	III and IV
5.	Gurdeep Chatwal	Organic chemistry of natural products	Vol –I & II revised 5 th Edition	Himalaya publishing house	2005	V

Books for Reference:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year	Units Covered
1	I. L. Finar	Stereochemistry and the Chemistry of Natural Products	Vol. II, 5 th Edition	Dorling Kindersley (India) Pvt. Ltd	1998	I and V
2	M. K. Jain	Organic Chemistry	12 th Edition	Sulthan and Chand Company, New Delhi.	2003	II and III
3	Dr. Jagadamba Singh and Dr. L.D.S Yadav	Organic Synthesis	4 th Edition	Pragati Prakashan, Meerut.	2009	III
4.	Vinay Prabha Sharma and Rakesh Kumar	Pericyclic Reactions and Organic Photochemistry	2 nd Edition	Pragati Prakashan, Meerut.	2011	IV
5.	V.K, Ahluwalia	Chemistry of Natural Products	2 nd Edition	Vishal Publishing Co., Jalandhar, Delhi.	2014	V

Web Reference:

<https://nptel.ac.in/courses/104/105/104105086/>

<https://nptel.ac.in/content/storage2/courses/104103071/pdf/mod8.pdf>

<https://www.slideserve.com/marvin-kirby/chapter-12-molecular-rearrangements>

<https://nptel.ac.in/courses/104/105/104105038/>

<https://www.uou.ac.in/lecturenotes/science/MSCH17/Chemistry%20LN%208%20natural%20products-converted.pdf>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Paper			Hours		Credits		
VI	20UCH6CC14		STEREOCHEMISTRY, MOLECULAR REARRANGEMENTS AND NATURAL PRODUCTS			5		5		
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓					✓				
CO2			✓		✓		✓		✓	
CO3	✓						✓			
CO4										✓
CO5		✓				✓		✓		
Number of Matches= 44, Relationship : High										

Prepared by:

1. Dr. J. Muneer Ahamath
2. Dr. A. Asrar Ahamed

Checked by: Dr. J. Sirajudeen

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
VI	20UCH6CC15	Core – XV	ELECTROCHEMISTRY, MOLECULAR SPECTROSCOPY AND GROUP THEORY	5	5	100	25	75

Course Outcomes (COs):

At the end of the course, students will be able to

- 1: Understand the basic concepts of electrochemistry and its applications
- 2: Compare the efficiency of various types of electrochemical cells
- 3: Infer the concepts of molecular spectroscopy
- 4: Solve the chemical structure using various spectral techniques
- 5: Predict the point group of a molecule

UNIT-I

15 hours

PROPERTIES OF ELECTROLYTES AND ITS APPLICATIONS

- 1.1 Ohm's law – conductance in metals and electrolytic solution – specific conductance, equivalent conductance, Effect of temperature and dilution on conductance, Kohlrausch law and its applications. [#]Arrhenius theory of electrolytic dissociation and its limitations – Weak and strong electrolytes according to Arrhenius theory[#] - Ostwald's dilution law-derivation, uses and its limitations, Elementary treatment of Debye –Huckel-Onsager theory of strong electrolytes.
- 1.2 Ionic mobility-definition, experimental proof for migration of ions, Transport number – definition, Hittorf's rule, Determination of transport number by Hittorf's method and moving boundary method, effect of concentration on transport number.
- 1.3 Conductometric titrations- Principle, advantages and conductometric titrations of HCl vs NaOH, CH₃COOH vs NaOH, HCl vs NH₄OH, CH₃COOH vs NH₄OH, AgNO₃ vs KCl and FeSO₄ vs K₂Cr₂O₇ (Problems from 1.1)

UNIT-II

15 hours

EQUILIBRIUM ELECTROCHEMISTRY

- 2.1 Galvanic cell – Definition, [#]chemical cell, concentration cell, reversible cell and irreversible cell[#], types of reversible electrodes – Metal-metal ion electrodes, amalgam electrodes, gas electrodes, metal-insoluble metal salt electrode and oxidation - reduction electrode, single electrode potential. Reference electrodes – primary and secondary reference electrode, standard electrode potential and its determination.
- 2.2 E.M.F. of galvanic cell and cell reaction – Cell e.m.f., sign conventions of cell e.m.f. and cell reaction, Nernst equation for cell e.m.f., Thermodynamics of galvanic cells – Relation between E.M.F. and ΔG , ΔH , ΔS , equilibrium constant (K), electrochemical series, standard cell.
- 2.3 Concentration cells – Electrode concentration cells – Amalgam and gas concentration cells, Electrolyte concentration cells - Concentration cells without transference and its e.m.f., concentration cells with transference and its e.m.f., liquid junction potential. (Problems from 2.2 and 2.3)

UNIT-III**15 hours****PROPERTIES OF EMR AND ABSORPTION SPECTROSCOPY**

- 3.1 Electromagnetic radiations – Definition, regions of electromagnetic radiations, Interaction of electro-magnetic radiations with molecules, quantization of energies in molecules - Translational, rotational, vibration, and electronic energies, molecular spectra - origin of molecular spectra.
- 3.2 Microwave spectroscopy -theory of microwave spectroscopy, selection rule, effect of isotopic substitution and calculation of moment of inertia and bond length of diatomic molecules.
- 3.3 Infrared spectroscopy – Theory, Hook's law, selection rules- (**Harmonic and anharmonic oscillators**), Expression for vibrational frequency, types of molecular vibrations – vibrations of HCl, CO₂ and H₂O molecules, Calculation of force constant- Applications of IR spectra – (**Functional group region**, finger print region and Hydrogen bonding only).
3. 4 Raman spectroscopy – [#]Raman Effect, Rayleigh and Raman scattering[#]– Stokes and anti-stokes lines, Modes of vibrations and change in polarizability of H₂O and CO₂, mutual exclusion principle, comparison between Raman and IR spectroscopy.

UNIT-IV**15 hours****MAGNETIC RESONANCE AND MASS SPECTRA**

- 4.1 NMR spectroscopy - Magnetic and non-magnetic nuclei, principle of nuclear magnetic resonance - shielding mechanism, chemical shift, factors affecting chemical shifts (electro negativity and anisotropic effect) - number of signals – proton counting - Spin-spin coupling, coupling constant, NMR spectrum of ethylalcohol.
- 4.2 ESR spectroscopy - theory of ESR spectra, hyperfine splitting, ESR spectra of hydrogen, **Deuterium, methyl, benzene anion, naphthalene anion, anthracene anion radicals** – comparison of NMR and ESR
- 4.3 Mass spectroscopy- Basic principle, [#]molecular ion peaks, base peaks, isotopic peaks, meta stable peaks[#], ring rule and nitrogen rule - mass spectra of toluene and branched alkanes.

UNIT-V**15 hours****ELECTRONIC SPECTROSCOPY AND GROUP THEORY**

- 5.1 UV-Visible spectroscopy – Theory of electronic spectroscopy, types of electronic transitions Franck – Condon Principle, Dissociation and Pre-dissociation spectra, **Factors affecting the absorption maximum**, Application to geometrical isomerism (maleic and fumaric acids, cis & trans stilbenes).
- 5.2 Group Theory- Introduction-symmetry elements, symmetry operations- Identity operation, n-fold proper axis of symmetry, Centre of symmetry, Plane of symmetry and n-fold improper axis of symmetry. Group- postulates, types-cyclic group, sub group, abelian and non-abelian group. Point group- definition, symmetry elements and their operations of the following molecules- H₂O, Ethylene, NH₃ and BF₃.

_____ # Self study

TEXT BOOKS:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year	Units Covered
1.	B. R. Puri, L. R. Sharma and M. S. Pathania	Principles of Physical Chemistry	48 th Edition	Vishal Publications, Jalandhar	2019	I, II, III, IV & V
2.	C. N. Banwell and E. M. Mccash	Fundamentals of Molecular Spectroscopy	30 th Reprint	Tata McGraw- Hill Publishing Company Limited, New Delhi,	2008	III, IV and V
3.	R.L. Madan and G.D. Tuli	Simplified Course in Physical Chemistry	5 th Revised and Enlarged Edition	S. Chand & Co., New Delhi	2009	I, II, III, IV & V
4.	N. N. Das	Symmetry and Group Theory for Chemists	Low Price Edition	Asian Books Private Limited	2016	V

Books for Reference:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year	Units Covered
1.	Samuel Glasstone	An Introduction to Electrochemistry	2 nd Edition Indian Reprint	East-West Edition, New Delhi	2016	I and II
2.	G. M. Barrow	Introduction to Molecular Spectroscopy	Indian Reprint	Tata-McGraw- Hill Edition	1993	III, IV
3.	B. S. Bahl, G. D. Tuli and Arun Bahl	Essentials of Physical Chemistry	28 th Edition	S. Chand & Co., New Delhi	2020	I, II, III, IV and V
4.	N. Kundu and S. K. Jain	Physical Chemistry	Revised Edition	S. Chand & Co., New Delhi	2000	I, II, III, IV and V
5.	A. Gupta and M. Kumar	Group Theory and Spectroscopy	1 st Edition	Pragathi Prakashan, Meerut	2018	V

Web Reference: Unit: III, IV and V (5.1) – <https://youtu.be/blvNJWuDtQY> (NPTEL)

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Paper				Hours	Credits			
VI	20UCH6CC15	ELECTROCHEMISTRY, MOLECULAR SPECTROSCOPY AND GROUP THEORY				5	5			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓		
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO5	✓	✓	✓			✓	✓			
Number of Matches= 43, Relationship : High										

Prepared by:

1. Dr. A. Jafar Ahamed
2. Dr. M. Syed Ali Padusha
3. Dr. M. Anwar Sathiq

Checked by: Dr. M. Seeni Mubarak

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. Marks	Internal Marks	External Marks
VI	20UCH6CC16P	Core –XVI	GRAVIMETRIC ESTIMATION AND SPECTROPHOTOMETRIC STUDY OF METAL COMPLEXES - PRACTICAL	5	5	100	20	80

Course out comes (COs):

At the end of the course, students will be able to

- 1: Synthesize inorganic complexes
- 2: Familiarize on the precipitating agents
- 3: Assess the stoichiometry of the complex
- 4: Understand the principle of photocolourimeter
- 5: Examine the optical density of a solution with variation in concentration.

(i) Gravimetric Estimation:

Using sintered glass crucible

1. Ni as nickel dimethyl glyoxime
2. Zn as zinc oxinate
3. Pb as lead chromate
4. Ba as barium chromate
5. Ca as calcium oxalate monohydrate

Using silica crucible

1. Ca as calcium sulphate
2. Pb as lead sulphate
3. SO₄ as barium sulphate

(ii) Spectrophotometric determination of mole fraction of metal and ligand in complexes

(Job's method)

1. Copper –EDTA complex
2. Cobalt –Hydrazinate complex
3. Zinc – EDTA complex
4. Chloro cuprate complex

Scheme of valuation

Record	-	10 marks
Procedure	-	10 marks
I. Gravimetric estimation	-	30 Marks

<1%	-	30 marks
1-2%	-	25 marks
2-3%	-	20 marks
>4 %	-	10 marks

II. Spectrometric study of metal complexes - 30 Marks

<1%	-	30 marks
1-2%	-	25 marks
2-3%	-	20 marks
>4 %	-	10 marks

Books for Reference:

S. No.	Author Name	Book Name	Edition	Publisher	Year	Units Covered
1.	Venkateswaran V. Veerasamy R. Kulandaivelu A. R	Basic Principles of Practical Chemistry	2 nd Edition	S. Chand & Co Pvt.Ltd, New Delhi	1997	All

Web Reference:

<https://vlab.amrita.edu/index.php?sub=2&brch=193&sim=350&cnt=1>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Paper			Hours		Credits		
VI	20UCH6CC16P		GRAVIMETRIC ESTIMATION AND SPECTROPHOTOMETRIC STUDY OF METAL COMPLEXES - PRACTICAL			5		5		
Course outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓				✓	✓	✓		
CO2	✓	✓	✓	✓		✓	✓	✓		
CO3	✓	✓	✓	✓		✓	✓	✓		
CO4		✓			✓		✓			
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Number of Matches=31, Relationship : Moderate										

Prepared by:

Checked by:

Dr. M. Purushothaman

1. Dr. S. Mohamed Rabeek
2. Mr. M. Varusai Mohamed

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
VI	20UCH6DE2A	DSE - II	ESSENTIAL MOLECULES FOR LIFE	5	4	100	25	75

Course outcome (COs):

At the end of the course, students will be able to

- 1: Describe the classification, structure and uses of amino acids and protein.
- 2: Explain the structure of mono and disaccharides.
- 3: Categorize the vitamins based on their functions
- 4: Illustrate the structure and functions of enzymes and hormones
- 5: Understand the significance of nucleic acid and lipids

UNIT-I

15 hours

Amino acids, peptides and proteins

1.1 Amino acids - nomenclature, classification, synthesis of α -amino acids, Zwitter ion, isoelectric point, reactions of carboxyl group and amino group.

1.2 Protein – Definition– biologically important proteins – sources of proteins – biological function of protein –classification of protein – based on the solubility – based on the increasing complexity of the structure- properties of protein – #color reaction of proteins#.

1.3 Peptide bond – definition – primary, secondary and tertiary structure of proteins.

UNIT-II

15 hours

Carbohydrates

2.1. Carbohydrates – #definition- classification# - **chemical reaction of glucose** structural elucidation of glucose

2.2. Fructose - occurrence, structural elucidation of fructose, chemical reactions and uses. Inter conversion of aldoses to ketoses.

2.3. Disaccharides - sucrose and maltose - properties, structure (elucidation not required) and uses. Polysaccharides-starch and cellulose - structure (elucidation not required) - properties and uses.

UNIT-III

15 hours

Vitamins

3.1. Vitamins -definition, general properties of vitamins, - water soluble vitamins – sources, deficiency symptoms and functions.

3.2. Fat soluble vitamins- sources, deficiency symptoms and functions.

3.3. Estimation of vitamins- vitamin B₁, C and A

UNIT-IV

15 hours

Enzymes and hormones

4.1. Enzymes - nomenclature - based on substrate, reaction, and classification of enzymes, chemical nature, factors affecting enzyme activity, mechanisms of enzyme action- lock and key, induced fit hypothesis, biological functions of enzymes, applications of enzymes- industrial uses.

4.2. Hormones – definition- salient feature of hormones – biological function of hormones - #chemical nature#.

4.3. Structure and functions of hormones - Thyroxin, oxytocin, insulin, vasopressin, Androgen, oestrogen, Progesterone and **Melatonin**.

UNIT– V**15hours****Nucleic acids and Lipids**

5.1. **Nucleic Acids**—definition- nucleosides, nucleotides, nitrogenous bases -types of nucleic acids - Watson and Crick model of DNA-biological functions of nucleic acids.

5.2. **RNA** – definition -Types of RNA - mRNA, tRNA and rRNA, functions of RNA- comparison of DNA and RNA.

5.3. **Lipids** – definition – structure of lipids -classification of lipids-simple lipids – oil and fats – difference between animal fat and plant fats – compound lipids – phospholipids –derived lipids – steroids.

_____ # Self study

.Text books:

S. No.	Author Name	Book Name	Edition	Publisher Detail	Year	Units Covered
1.	P.L.Soni,H.M.Chawla	Text book of organic chemistry	26 th Edition	S.Chand & Co., New Delhi	1997	I & II
2.	O.P.Agarwal	Chemistry of organic natural products	15 th Edition	Goel publishing house, Meerut.	2015	III, IV & V
3.	Duls Fatima,L.M. Narayanan, R.P.Meyyan, K.Nallasingam, S.Prasanna kumar and N.Arumugam	Biochemistry	4 th Edition	Saras Publication, Nagercoil.	2013	III, IV & V

References:

S.No.	Author Name	Book Name	Edition	Publisher Detail	Year	Units Covered
1.	B.S.Bahl and Arun Bahl	Advanced organic chemistry	18 th Edition	S.Chand & company, New Delhi	2006	I & II
2.	M.K.Jain, S.C.Sharma	Organic Chemistry	3 rd Edition	Shoban Lal Nagin Chand & co., Jalandhar	1998	III, IV & V

Web Reference: 1. <https://www.booktopia.com.au>

2. <https://ncert.nic.in/textbook/pdf>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes										
Semester	Code			Title of the Paper			Hours		Credits	
V	20UCH6DE2A			ESSENTIAL MOLECULES FOR LIFE			5		4	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓			✓	✓	✓		
CO2	✓	✓	✓		✓	✓	✓	✓		✓
CO3	✓	✓	✓			✓	✓	✓		
CO4	✓	✓	✓			✓	✓	✓		✓
CO5	✓	✓	✓	✓		✓	✓	✓	✓	
Number of Matches= 35, Relationship : High										

Prepared by:

Dr. S. S. Syed Abuthahir

Checked by:

Dr. A. Zahir Hussain

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. Marks	Internal Marks	External Marks
VI	20UCH6DE2B	DSE-II	ESSENTIALS OF BIOINORGANIC CHEMISTRY	5	4	100	25	75

Course Outcomes (COs):

At the end of the course, students will be able to

1. Classify the essential and trace metals in biological system.
2. Explain the role of metals in biological processes.
3. Demonstrate the transformation of energy by cells.
4. Describe the process of oxygen storage.
5. Paraphrase the kinetics of electron transfer in biology.

UNIT – I

15 hours

METAL IONS IN BIOLOGICAL SYSTEM

- 1.1. Essential and trace metals-classification, functions of elements based on their biological system.
- 1.2. Metal storage and transport, oxygen binding metallo-biomolecules, electron carriers, non protein metal transport.

UNIT – II

15 hours

ROLE OF METAL IONS IN BIOLOGICAL PROCESS

- 2.1. Biochemistry of sodium, potassium, calcium, magnesium, zinc, nickel, manganese, iron, cobalt, copper, molybdenum, vanadium and chromium.
- 2.2. Role of calcium in muscle contraction and blood clotting.

UNIT – III

15 hours

BIOENERGETICS AND ATP CYCLE

- 3.1. Structure and functions of carbonic anhydrase, carboxy peptidase A and superoxide dismutase.
- 3.2. Biological energy, ATP cycle, DNA polymerization, Watson and Crick model, replication of DNA, prokaryotic DNA polymerase-DNA polymerase I, II & III- Proof reading and DNA repair-Glucose storage- glycogenesis, glycogenolysis, #gluconeogenesis, catabolism#.

UNIT – IV

15 hours

TRANSPORT AND STORAGE OF DIOXYGEN

- 4.1. Hemoglobin and Myoglobin-functions. Iron in hemoglobin and myoglobin, kinetics of haemoglobin and myoglobin
- 4.2. Oxygenation, conformational changes, transport of carbondioxide, Bohr effect. Hemoglobin modeling.

UNIT – V

15 hours

ELECTRON TRANSFER IN BIOLOGY

- 5.1. Electron transport system-components involved in electron transport chain-substratedehydrogenases, flavoproteins, quinones, plastoquinones, cytochromes.
- 5.2. Mechanism of action of cytochrome C, cytochrome P450, special functions of cytochrome in cellular electron transport. Iron-#Sulphur proteins-rubredoxin, ferredoxin#.

#_____# Self study

Text Books:

S. No.	Author Name	Book Name	Edition	Publisher	Year	Units Covered
1.	Neerja Gupta & Monal singh	Essentials of bioinorganic chemistry	5 th Edition	Pragati Prakashan, Meerut.	2014	I-V
2.	K. Hussain Reddy	Bioinorganic chemistry	1 st Edition	New Age International Limited, New Delhi	2005	II, IV, V
3.	P.S.Kalsi & J.P.Kalsi	Bioorganic, Bioinorganic and Supramolecular Chemistry	1 st Edition	New Age International Limited, New Delhi	2007	III

Books for Reference:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year	Units Covered
1.	Pabitra Krishna Bhattacharya & Prakash B. Samnani	Metal ions in bio chemistry	2 nd Edition	CRC Press, New Delhi	2020	I, II, V
2.	Sathya prakash, G.D.Tuli, S.K.Basu & R.D.Madhan	Advanced inorganic chemistry	5 th Edition	S. Chand & Company, New Delhi.	2007	II, IV, V
3.	Asim K Das	Bioinorganic Chemistry	6 th Edition	Books & Allied Limited, Kolkatta	2013	I-V

Web Reference:

<https://nptel.ac.in/courses/104/105/104105031/>

<https://nptel.ac.in/courses/104/104/104104109/>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Course			Hours			Credits	
VI	20UCH6DE2B		ESSENTIALS OF BIOINORGANIC CHEMISTRY			5			4	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓		✓	✓		✓	✓	✓		
CO2	✓	✓	✓	✓		✓	✓	✓	✓	
CO3	✓	✓	✓	✓			✓	✓	✓	
CO4	✓	✓	✓	✓			✓	✓	✓	
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Number of matches = 37, Relationship: High										

Prepared by: Dr. F. M. Mashood Ahamed

Checked by: Dr. A. Zahir Hussain

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
VI	20UCH6DE3AP	DSE-III	PHYSICAL CHEMISTRY NON ELECTRICAL – PRACTICAL	4	4	100	20	80

Course outcomes (COs):

At the end of the course, students will be able to

- 1: Detect the purity of a mixture using CST
- 2: Analyze the colligative properties of organic compounds.
- 3: Determine eutectic temperature and composition of given mixture.
- 4: Measure the hydrophobicity of solute molecule
- 5: Plan and perform the experiments along with their interpretation.

List of Experiments:

- 60 marks

1. Critical Solution Temperature of Phenol –Water system.
2. Effect of impurity (NaCl) on Critical Solution Temperature of Phenol –Water system.
3. Determination of Transition Temperature of a salt hydrate.
4. Determination of molecular weight by Rast's macro method.
5. Determination of k_f by Rast's macro method.
6. Determination of molecular weight by Ostwald viscometer.
7. Phase diagram (Simple eutectic system)
8. Determination of rate constant of acid catalyst hydrolysis of an ester
9. Determination of Partition co-efficient of iodine between water and carbon tetrachloride

I. Scheme of valuation

Record	-	10 marks
Procedure with formula	-	10 marks
Experiment	-	60 marks
1-2%	-	60 marks
2-3%	-	50 marks
3-4%	-	40 marks
>4%	-	25 marks

Books for Reference:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year
1	Venkateswaran V. Veerasamy R. Kulandaivelu A.R	Basic principles of Practical Chemistry	2 nd Edition	S. Chand & Co Pvt. Ltd, New Delhi	1997

Web Reference:

<https://labmonk.com/partition-co-efficient-of-iodine-in-distilled-water-and-carbon-tetrachloride>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code			Title of the Paper			Hours		Credits	
VI	20UCH6DE3AP			PHYSICAL CHEMISTRY NON ELECTRICAL – PRACTICAL			4		4	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓					✓				
CO2			✓				✓			
CO3	✓						✓			
CO4				✓						
CO5		✓				✓		✓		
Number of Matches = 31, Relationship : Moderate										

Prepared by:

Checked by:

Dr. M. Purushothaman

1. Dr. S. Mohamed Rabeek
2. Mr. M. Varusai Mohamed

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
VI	20UCH6DE3BP	DSE-III	ADVANCED PHYSICAL CHEMISTRY - PRACTICAL	4	4	100	20	80

Course outcomes (COs):

At the end of the course, students will be able to

- 1: Determine the enthalpy change of a reaction between strong acids and strong bases
- 2: Find the order of saponification reaction
- 3: Investigate the velocity constant for inversion of cane sugar
- 4: Evaluate equilibrium constant using the law of mass action
- 5: Relate the quantity of gas adsorbed on a solid surface at gas pressure and constant temperature.

List of Experiments:

1. Heat of neutralization of sodium hydroxide and hydrochloric acid by calorimetry.
2. Determining the order of Saponification of ethyl acetate with sodium hydroxide.
3. Finding the order of reaction and velocity constant for the inversion of cane sugar by acids.
4. Determination of the equilibrium constant of the esterification reaction between acetic acid and ethanol.
5. Determination of equilibrium constant of the Keto-Enol tautomerism of ethylacetoacetate.
6. Experimental verification of Freundlich's adsorption isotherm.
7. Experimental verification of Langmuir adsorption isotherm.

Record	-	10 marks
Procedure with formula	-	10 marks
Experiment	-	60 marks
Up to 5%	-	60 marks
5-10%	-	50 marks
10-15%	-	40 marks
>15%	-	25 marks

Books for Reference:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year
1	Venkateswaran V. Veerasamy R. Kulandaivelu A.R	Basic principles of Practical Chemistry	2 nd Edition	S. Chand & Co Pvt. Ltd, New Delhi	1997
2.	Gurtu-Gurtu	Advanced Physical Chemistry Experiments	3 rd Edition	Pragathi Prakashan Publications, Meerut	2007

Web Reference:

[https://www.ccri.edu/chemistry/courses/chem_1100/wirrkala/labs/Enthalpy of Neutralization.pdf](https://www.ccri.edu/chemistry/courses/chem_1100/wirrkala/labs/Enthalpy_of_Neutralization.pdf)

<https://www.learnbse.in/determine-the-enthalpy-of-neutralisation-of-hydrochloric-acid-with-sodium-hydroxide-solution/>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Paper			Hours		Credits		
VI	20UCH6DE3BP		ADVANCED PHYSICAL CHEMISTRY- PRACTICAL			4		4		
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓					✓				
CO2			✓				✓			
CO3	✓						✓			
CO4										
CO5		✓				✓		✓		
Number of Matches = 31, Relationship : Moderate										

Prepared by:

1. Dr. S. K. Periyasamy
2. Dr. S. Mohamed Rabeek

Checked by:

Dr. M. Purushothaman

Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
VI	20UCH6EC2	Extra Credit Course - II	CHEMISTRY FOR COMPETITIVE EXAMINATIONS	--	4*	100	-	100

Course outcomes (COs):

At the end of the course, students will be able to

- 1: Understand the periodic properties, chemical bonding and role of metal ions.
- 2: Analyze the electronic effects, aromaticity and functional groups of organic compounds.
- 3: Identify the principle and applications of titrations
- 4: Evaluate the chemical compounds using spectral techniques
- 5: Describe the basics of kinetics and surface phenomenon.

UNIT-I

Periodic properties and Bioinorganic Chemistry

1.1. Periodic Table: Periodic classification of elements and periodicity in properties; general methods of isolation and purification of elements.

1.2. Chemical Bonding and Shapes of Compounds: Types of bonding; VSEPR theory and shapes of molecules; hybridization; dipole moment; ionic solids; structure of NaCl, CsCl, diamond and graphite; lattice energy.

1.3. Bioinorganic Chemistry: Essentials and trace elements of life; basic reactions in the biological systems and the role of metal ions, especially Fe^{2+} , Fe^{3+} , Cu^{2+} and Zn^{2+} ; structure and function of hemoglobin and myoglobin and carbonic anhydrase.

UNIT – II

Basic Concepts in Organic Chemistry and Stereochemistry

2.1. Electronic effects (resonance, inductive, hyperconjugation) and steric effects and its applications (acid/base property); optical isomerism in compounds with and without any stereocenters (allenes, biphenyls); conformation of acyclic systems (substituted ethane/n-propane/n-butane) and cyclic systems (mono- and di-substituted cyclohexanes).

2.2. Aromatic and Heterocyclic Chemistry: Monocyclic, bicyclic and tricyclic aromatic hydrocarbons, and monocyclic compounds with one hetero atom (Oxygen): synthesis, reactivity and properties.

2.3. Qualitative Organic Analysis: Identification of functional groups by chemical tests; elementary UV, IR and ^1H NMR spectroscopic techniques as tools for structural elucidation

UNIT – III

Analytical Chemistry

3.1. Principles of qualitative and quantitative analysis; acid-base, oxidation- reduction and complexometric titrations using EDTA; precipitation reactions; use of indicators.

3.2. Use of organic reagents in inorganic analysis; radioactivity; nuclear reactions; applications of isotopes.

3.3. Gravimetric Analysis: Theory, principles, precipitation reagents (DMG, Oxine), Determination of Nickel as dimethylglyoximate, Aluminium as 8-hydroxyquinolate & Chloride as silver chloride.

UNIT – IV

Instrumental Methods of Analysis

4.1. UV-visible, fluorescence and FTIR spectrophotometry, NMR and ESR spectroscopy, mass spectrometry, atomic absorption spectroscopy, Mössbauer spectroscopy (Fe and Sn) and X-ray crystallography.

4.2. Chromatography including GC and HPLC. Electroanalytical methods- polarography, cyclic voltammetry, ion-selective electrodes. Thermoanalytical methods.

4.3. Atomic Absorption Spectroscopy (AAS): Principles of AAS, Instrumentation – flame AAS and furnace AAS, resonance line sources, sensitivity and detection limits in AAS, interferences –chemical and spectral, evaluation methods in AAS and applications in qualitative and quantitative analysis.

UNIT – V

Chemical kinetics and Surface chemistry

5.1. Kinetics - Elementary, parallel, opposing and consecutive reactions. Steady state approximation. Mechanisms of complex reactions. Unimolecular reactions. Potential energy surfaces and classical trajectories, Concept of Saddle points, Transition state theory: Eyring equation, thermodynamic aspects.

5.2. Kinetics of polymerization. Catalysis concepts and enzyme catalysis. Kinetic isotope effects. Fast reaction kinetics: relaxation and flow methods. Diffusion controlled reactions. Kinetics of photochemical and photophysical processes.

5.3. Surfaces and Interfaces: Physisorption and chemisorption. Langmuir, Freundlich and Brunauer–Emmett– Teller (BET) isotherms. Surface catalysis: Langmuir-Hinshelwood mechanism. Surface tension, viscosity. Selfassembly. Physical chemistry of colloids, micelles and macromolecules.

TEXT BOOKS:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year
1.	B.R. Puri and L.R. Sharma	Principles of Inorganic Chemistry	5 th Edition	S. Chand & Co Pvt. Ltd, New Delhi	2000
2.	P. L. Soni	Text Book of Inorganic Chemistry	3 rd Edition	S. Chand & Co. New Delhi	1999
3.	P. K. Mani and A.O. Thomas	Textbook For Practical Chemistry for B.Sc. Main Students	4 th Edition	Xavier press, Cannanore	2006
4.	P. L. Soni and H. M. Chawla	Text Book of Organic Chemistry	28 th Edition	Sulthan and Chand company, New Delhi.	1999
5.	B. R. Puri, L. R. Sharma and M. S. Pathania	Principles of Physical Chemistry	5 th Edition	Vishal Publications, Jalandhar.	2002

Books for Reference:

S. No.	Author Name	Book Name	Edition	Publisher detail	Year
1	R. D Madan	Modern Inorganic Chemistry	4 th Edition	S. Chand & Co Pvt. Ltd, New Delhi	2009
2	B. R. Puri, L.R.Sharma and K. C.Kalia	Principles of Inorganic Chemistry	7 th Edition	Milestone publishers and distributors, New Delhi	2012
3	M. K. Jain	Organic Chemistry	12 th Edition	Sulthan and Chand Company, New Delhi.	2003
4.	Bahl and Arun Bahl	Advanced Organic Chemistry	19 th Edition	Sulthan and Chand Company, New Delhi.	2005
5.	R.L. Madan and G.D. Tuli	Simplified Course in Physical Chemistry	5 th revised and enlarged edition	S.Chand & Co., New Delhi,	2009

Web Reference: Unit: I - https://nptel.ac.in/content/syllabus_pdf/104101121.pdf

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Paper				Hours		Credits	
VI	20UCH6EC2		CHEMISTRY FOR COMPETITIVE EXAMINATIONS				-		4*	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓					✓				
CO2			✓		✓		✓		✓	
CO3	✓									
CO4										✓
CO5		✓				✓		✓		
Number of Matches= 33, Relationship : Moderate										

Prepared by:
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Checked by:
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Note:

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very poor	Poor	Moderate	High	Very high