

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			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
	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	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.

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		VOLUMETRIC AND PHOTOMETRIC ESTIMATION - 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 = 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

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
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S.No.	Author Name	Book Name	Edition	Publisher Detail	Year	Units Covered
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2.	M.K. Jain	Organic Chemistry	12 th Edition	S.Chand & Co., New Delhi	2003	II & III
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
3.	Bahl and Arun Bahl	Advanced Organic Chemistry	19 th Edition	Sulthan and Chand company, New Delhi	2005	III
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			INDUSTRIAL CHEMISTRY - PRACTICAL			3		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 = 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, CHEMOTHERAPHY 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

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
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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 - 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
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	Code			Title of the Course			Hours	Credits		
IV	20UCH3CC6P			Preparation of Domestic Products and their Quality Testing - 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= 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 References1 <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		QUALITATIVE ANALYSIS OF INORGANIC SALTS - 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 (✓) =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:

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