A.D.M. COLLEGE FOR WOMEN

(AUTONOMOUS)

Nationally Accredited with "A" Grade by NAAC - 3rd Cycle
(Affiliated to Bharathidasan University, Thiruchirappalli)
No.1, College Road, Velippalayam,
Nagapattinam – 611 001, Tamil Nadu, India

PG & RESEARCH DEPARTMENT OF CHEMISTRY

(For the candidates admitted from the academic year 2021-2022)

B.Sc., CHEMISTRY

SYLLABUS

2021-2024

A.D.M COLLEGE FOR WOMEN (AUTONOMOUS),

Nagapattinam

UG Programme - B.Sc Chemistry

(For the candidates admitted from 2021 – 2022 onwards)

Bloom's Taxonomy Based Assessment Pattern

Knowledge Level

K1 – Recalling	**K2** – Understanding	**K3** – Applying	**K4** – Analyzing	**K5** – Evaluating	**K6** – Creating

1. Part I, II and III

Theory (External + Internal = 75 + 25 = 100 marks)

External/Internal					
Knowledge Level	**Section**	**Marks**	**Hrs**	**Total**	**Passing Mark**
K1-K3	A (Answer all)	10 ×2 = 20	3	75	30
K3-K6	B (Either or pattern)	5 × 5 = 25			
K3-K6	C (Answer 3 out of 5)	3 × 10 = 30			

PG AND RESEARCH DEPARTMENT OF CHEMISTRY
(For the candidates admitted from 2021 – 2022)

B.Sc. CHEMISTRY

Programme Educational Objectives (PEO)

PEO 1	To develop the skill in problem solving, critical thinking and enhance the knowledge in chemistry.
PEO 2	To provide the students an in-depth understanding of the basic concepts of chemical sciences.
PEO 3	To provide a detailed knowledge of terms, concept, methodologies, principles and experimental techniques involved in various fields of chemistry.
PEO 4	To prepare the students to pursue higher studies and to develop sustainable innovative solutions for the nation.
PEO 5	To inculcate the scientific temperament in the students.

Programme Outcomes (PO) UG

On completion of the course the learner will be able

PO 1	To develop interest in the study of chemistry as a discipline.
PO 2	To appreciate the achievements in chemistry and to know the role of chemistry in nature and in society.
PO 3	To be familiarized with the emerging areas of chemistry and their applications in various spheres of chemical sciences and to appraise the students of its relevance in future studies.
PO 4	To develop skills in proper handling of apparatus and chemicals.
PO 5	To be exposed to the different processes used in industries and their applications.

Programme Specific Outcomes (PSO) B.Sc

On completion of the course the learner will be able

PSO 1	To gain knowledge of chemistry through theory and practical's.
PSO 2	The programme provides backbone of Physical, Inorganic, Organic and Analytical Chemistry.
PSO 3	Positive approach towards Environment from the chemistry perspective.
PSO 4	Entrepreneurial skills are developed in students so as to make them start their own Industries / Business in core chemistry fields.
PSO 5	To explain nomenclature, stereochemistry, structures, reactivity and mechanism of the chemical reaction

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PG AND RESEARCH DEPARTMENT OF CHEMISTRY

COURSE STRUCTURE OF UG PROGRAMME –B. Sc CHEMISTRY

Part	Title of the part	No. of Papers	Hours	Credit
I	LC- Language Course	4	24	12
II	ELC – English Language Course	4	24	12
III	CC- Core Course	13	72	65
	AC –Allied Course	6	28	18
	MBE - Major Based Elective	3	15	15
IV	NME - Non- Major Elective	2	4	4
	SBE - Skill Based Elective	3	6	6
	SSD – Soft Skill Development	1	2	2
	ES - Environmental Studies	1	2	2
	VE - Value Education	1	2	2
V	EA - Extension Activities	0	0	1
	GS - Gender Studies	1	1	1
	Total	**39**	**180**	**140**

Passing Minimum:

A candidate shall be declared to have passed in each course if she secures not less than 40% marks out of 75 marks (i.e., 30 marks) in the End Semester Examination (SE) and 40% out of 25 marks (i.e., 10 marks) in the Continuous Internal Assessment(CIA).

* Extra Credit Courses:

• Semester I –Food & Nutrition -I
• Semester II- Food & Nutrition - II

A.D.M. COLLEGE FOR WOMEN (AUTONOMOUS), NAGAPATTINAM

PG & RESEARCH DEPARTMENT OF CHEMISTRY

B.Sc., CHEMISTRY

Course Structure under CBCS

(For the candidates admitted from the academic year 2021-2022 onwards)

Sem.	Part	Course	Title	Ins. Hrs / week	Credit	Exam Hours	Marks		Total Marks
							CIA	SE	
I	I	Language Course – I (LC)	Tamil I	6	3	3	25	75	100
	II	Language English Course- I (ELC)	English I	6	3	3	25	75	100
	III	Core Course -I (CC)	General Chemistry I	6	6	3	25	75	100
		Core Practical-I (CP)	Volumetric Analysis (P)	3	-	-	-	-	-
		First Allied Course- I (AC)	Maths I / Zoology I	4	3	3	25	75	100
		First Allied Course- II (AC)	Maths II / Zoology II (P)	3	-	-	-	-	-
	IV		Value Education	2	2	3	25	75	100
			Total	**30**	**17**				**500**
II	I	Language Course –II (LC)	Tamil II	6	3	3	25	75	100
	II	Language English Course- II (ELC)	English II	6	3	3	25	75	100
	III	Core Practical-I (CP)	Volumetric Analysis (P)	3	3	3	40	60	100
		Core Course -II (CC)	General Chemistry II	6	6	3	25	75	100
		First Allied Course- II (AC)	Maths II / Zoology II (P)	3	3	3	25/ 40	75/ 60	100
		First Allied Course- III (AC)	Maths III / Zoology III	4	3	3	25	75	100
	IV		Environmental Studies	2	2	3	25	75	100
			Total	**30**	**23**				**700**
III	I	Language Course – III (LC)	Tamil III	6	3	3	25	75	100
	II	Language English Course- III (ELC)	English III	6	3	3	25	75	100
	III	Core Course -III (CC)	General Chemistry III	6	6	3	25	75	100
		Core Practical-II (CP)	Qualitative analysis (P)	3	-	-	-	-	-
		Second Allied Course-I (AC)	Physics I	4	3	3	25	75	100
		Second Allied Course-II (AC)	Physics II (P)	3	-	-	-	-	-
	IV	Non Major Elective I (NME)	Chemistry of Consumer Products /Chemistry in Every Day Life - I	2	2	3	25	75	100
			Total	**30**	**17**				**500**

IV	I	Language Course – IV (LC)	Tamil IV	6	3	3	25	75	100
	II	Language English Course-IV (ELC)	English IV	6	3	3	25	75	100
	III	Core Practical -II (CP)	Qualitative analysis (P)	2	3	3	40	60	100
		Core Course-IV (CC)	General Chemistry IV	5	4	3	25	75	100
		Second Allied Course-II (AC)	Physics II (P)	3	3	3	40	60	100
		Second Allied Course-III (AC)	Physics III	4	3	3	25	75	100
	IV	Skill Based Elective I (SBE)	Pharmaceutical Chemistry/ Forensic Science	2	2	3	25	75	100
		Non Major Elective II (NME)	Food Science/ Chemistry in Every Day Life - II	2	2	3	25	75	100
			Total	**30**	**23**				**800**
V	III	Core Course- V (CC)	Inorganic Chemistry I	5	5	3	25	75	100
		Core Course- VI (CC)	Organic Chemistry I	5	5	3	25	75	100
		Core Course- VII (CC)	Physical Chemistry I	6	6	3	25	75	100
		Core Practical –III (CP)	Physical Chemistry (P)	3	3	3	40	60	100
		Major Based Elective - I (MBE)	Analytical Chemistry / Material and Nano Technology	5	5	3	25	75	100
	IV	Skill Based Elective II (SBE)	Applied Chemistry / Industrial Chemistry	2	2	3	25	75	100
		Skill Based Elective III (SBE)	Polymer Chemistry / Green Chemistry	2	2	3	25	75	100
			Soft Skill Development	2	2	3	25	75	100
			Total	**30**	**30**				**800**
VI	III	Core Course- VIII (CC)	Organic Chemistry II	6	6	3	25	75	100
		Core Course- IX (CC)	Physical Chemistry II	6	6	3	25	75	100
		Core Practical –IV (CP)	Gravimetric and Organic Analysis (P)	6	6	6	40	60	100
		Major Based Elective - II (MBE)	Nuclear, Industrial and Metallic State / Petroleum Chemistry	6	5	3	25	75	100
		Major Based Elective - III (MBE)	Agricultural Chemistry / Environmental Chemistry	5	5	3	25	75	100
	V		EA - Extension Activities	-	1	-	-	-	-
			GS – Gender Studies	1	1	3	25	75	100
			Total	30	29				600
			Grand Total	**180**	**140**				**3900**

Semester-I / Core Course-I(CC)	**GENERAL CHEMISTRY-I**	Course Code: QUA
Instruction Hours: 6	Credits: 6	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100

Cognitive Level	**K1-Recalling** **K2-Understanding** **K3-Applying** **K4-Analyzing** **K5-Evaluating** **K6-Creating**	
Course Objectives	• To learn the periodic properties of elements and its classifications. • To understand the theoretical aspects of qualitative and quantitative analyses. • To understand the basics of alkanes, reactive intermediates and reaction mechanisms. • To learn about the chemistry of cycloalkanes, alkenes and alkynes. • To learn about the types, preparation and properties of sols, colloids and emulsions and the determination of molecular weight of macromolecules	
UNIT	**CONTENT**	**HOURS**
Unit I	**PERIODIC TABLE & PERIODIC PROPERTIES** Quantum Numbers, Filling up of atomic orbitals: Paulis's exclusion Principle, Aufbau Principle, Hund's rule of maximum multiplicity – electronic configuration. Stability associated with half-filled and completely filled orbitals. Periodic Properties of Elements: Variation of atomic volume, atomic and ionic radii, ionization potential, electron affinity, electro negativity along periods and groups, Pauling scale of electro negativity. Classification of elements into s,p,d and f block elements.	**18 Hrs**
Unit II	**ANALYTICAL METHODS** Qualitative Inorganic Analysis **–** Dry test, Flame test, Cobalt Nitrate test- Wet test. Confirmatory test for acid radicals, interfering acid radicals – elimination of interfering acid radicals. Solubility product, common ion effect, complexation, oxidation – reduction reactions involved in identification of anions and cations – separation of cations into groups- Semi micro analysis of simple salts. Volumetric Analysis – preparation of standard solutions – Normality, Molarity and Molality by titrimetric reactions – acid-base, redox, precipitation and complexometric titrations – indicators – effect of change in pH- selection of suitable indicators.	**18 Hrs**
Unit III	**ALKANES, REACTIVE INTERMEDIATES & METHODS FOR REACTION MECHANISMS** Introduction – Inductive, mesomeric, electrometric effects and hyperconjugation – structure of organic molecules based on sp^3, sp^2 and sp hybridization. Alkanes – sources of alkanes – general preparation – general properties – conformational analysis of ethane and n-butane. Carbocations, Carbanions, Carbenes and Nitrenes – Generation and stability of	**18 Hrs**

	reactive intermediates - Correlation of reactivity with structure of reactive intermediates. Free radicals- Generation, Stability, identification methods. Free radical halogenation reactions and their mechanism. Homolytic & Heterolytic Cleavages of bonds-Characteristics of nucleophilic, electrophilic and free radical reactions. Thermodynamic and kinetic aspects, Hammond's postulates, isotope effects, Energy Profile diagrams – Intermediate versus transition state, product analysis and its importance, crossover experiments, kinetic methods, isotopic effects.	
Unit IV	**CHEMISTRY OF CYCLOALKANES, ALKENE, DIENES AND ALKYNES** Preparation of Cycloalkanes – Chemical Properties – Relative stability of cyclopropane to cyclooctane – Baeyer's strain theory- limitations- Mono and disubstituted cyclohexanes. Alkene – Nomenclature – Petroleum source of alkenes and aromatics – General methods of preparation of alkenes- Chemical properties – markovinkov's rule and peroxide effect – uses- elimination reactions and its mechanisms (E1,E2). Dienes- Structure and Properties – conjugated dienes – stability and resonance – electrophilic addition – 1,2-addition and 1,4-addition. Alkynes- Nomenclature – General methods of preparation- Physical properties- Chemical properties – uses.	**18 Hrs**
Unit V	**COLLOIDS AND MACROMOLECULES** Colloids – Definition & types of colloids- Preparation, purification (dialysis, electro dialysis and ultrafiltration) and stability of colloids, Gold number. Properties of Colloids – Kinetic, Optical and Electrical properties. Emulsions – Types of emulsions, preparation, properties and applications, Donnan membrane equilibrium. Osmosis – Reverse Osmosis and Desalination. Macromolecules – Molecular Weight of macromolecules- determination of molecular weight by osmotic pressure and light scattering methods.	**18 Hrs**
Unit VI Self Study	Electronic Configuration of Poly electronic atoms & Preparation and Properties of higher order alkenes and dienes.	

Text Book:

1. A.K.De, " A Textbook of Inorganic Chemistry" New age international publishers, 9th edition , 2002.
2. B.S. Bahl and Arun Bahl "Advanced Organic Chemistry, New Delhi, Sultan Chand and Co.,(22th edition) (2016)
3. B.R.Puri,L.R. Sharma ,K.K. Kalia "Principles of Inorganic Chemistry", New edition: Shoban Lal Nagin chand and co,.35th edition, 2013.

Reference Books:

1. R.D. Madan, "Modern Inorganic Chemistry", 2nd edition, S. Chand & Company Ltd., 2000.
2. P.L. Soni, "Text book of Inorganic Chemistry", 20th revised edition, Sultan Chand & Sons, 2000.
3. B.R. Puri, L.R. Sharma, K.K. Kalia, Principles of Inorganic Chemistry, 23rd edition, New Delhi, Shoban Lal Nagin Chand & Co., (1993).
4. J.D. Lee, 'Concise Inorganic Chemistry', 20th revised edition, Sultan Chand & Sons, 2000.
5. R. Gopalan, P.S. Subramanian & K. Rengarajan, "Elements of Analytical Chemistry", 2nd edition, Sultan Chand & Sons, 1000.

Web - Resources:

1. https://www.topfreebooks.org.
2. https://www.e-booksdirectory.com

Course Outcomes:

On completion of the course the learner will be able

CO 1:	To understand the address of the electron and the concept of indicators and dilution.
CO 2:	To know the physical and chemical properties and uses of alkali metals, alkaline earth metals
CO 3:	Recognize the basic practical skills for the synthesis of alkenes, alkynes and cycloalkanes.
CO 4:	Predict the geometry and hybridization of molecules in organic chemistry.
CO 5:	Apply the concept and uses of colloids in the applied field.

Mapping of Course Outcomes with Programme Outcomes / Programme Specific Outcomes:

CO/PO	**PO**					**PSO**							
	1	2	3	4	5	1	2	3	4	5	6	7	8
CO1	S	S	S	M	S	S	S	S	W	S	S	S	S
CO2	S	S	S	S	S	S	S	M	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	M	S	S	S	S
CO4	S	S	S	M	S	S	S	S	M	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S	S	S	S

S - Strongly Correlated

M - Moderately Correlated

W-Weakly Correlated

N – No Correlation

Semester-I& II / Core Practical-I (Practical)	**VOLUMETRIC ANALYSIS PRACTICAL**	Course Code: QUBY
Instruction Hours: 3	Credits: 3	Exam Hours: 3
Internal Marks -40	External Marks-60	Total Marks: 100

Course Objectives:

- To know the estimation of several cations and anions.
- To know the estimation of total hardness of water.
- To carry out the saponification value of an oil

I Titrimetric Quantitative analysis

1. Estimation of HCl
2. Estimation of Na_2CO_3
3. Estimation of oxalic acid
4. Estimation of Iron (II) Sulphate
5. Estimation of Ca (II)
6. Estimation of $KMnO_4$
7. Estimation of Fe (II) solution using internal and external indicators
8. Estimation of Cu (II) sulphate by $K_2Cr_2O_7$ solution
9. Estimation of Mg (II) by EDTA Solution
10. Estimation of Ca (II) by EDTA Solution

II-Applied Experiments

1. Estimation of Total hardness of water
2. Estimation of Saponification value of an oil

Text Book:

1. V.Venkateshwaran, R.Veeraswamy, A.R. Kulandaivelu Basic Principles of Practical Chemistry 2nd edition 1997

Reference Books:

1. G. Svehla- Vogel's Quantitative Inorganic Analysis 7th edition Pearson education Ltd.
2. J. Mendham, R.C. Denney, J.D. Barnes & M.J.K. Thomas- Vogel's Textbook of quantitative chemical analysis 6th edition Pearson education Ltd.

Web- Resources:

1. https://www.bookrix.com.

MARK DISTRIBUTION:

Scheme of valuation	**Max. Marks**
Internal Marks	40
Brief Procedure	05
Record	10
Experiment	45
Mark Distribution **% of Error** < 1%	45
1-2%	35
2-3 %	25
3-4%	15
>4%	10

Course Outcomes:
On completion of the course the learner will be able

CO 1:	Understand the basic chemistry skills through quantitative analytical experiments
CO 2:	The learners able to know the techniques of titrimetric analysis

Mapping of Course Outcomes with Programme Outcomes / Programme Specific Outcomes:

CO/PO	PO					**PSO**							
	1	2	3	4	5	1	2	3	4	5	6	7	8
CO1	S	S	S	S	S	S	S	S	S	M	S	S	S
CO2	S	S	S	S	S	S	S	S	S	M	S	S	S

S - Strongly Correlated

M - Moderately Correlated

W-Weakly Correlated

N – No Correlation

Semester-II / Core Course-II	**GENERAL CHEMISTRY –II**	Course Code: QUC
Instruction Hours: 6	Credits: 6	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100

Cognitive Level	**K1-Recalling** **K2-Understanding** **K3-Applying** **K4-Analyzing** **K5-Evaluating** **K6-Creating**	
Course Objectives	• To understand the principles of bonding and theories of chemical bonding. • To understand the chemistry of S-block elements and metallurgy of zero group elements. • To understand the aromatic character of benzene type molecules and to learn the reaction mechanisms involved in haloalkanes and halobenzenes. • To learn the mechanism of Nucleophillic substitution and Elimination reactions • To understand about the properties of atoms, characteristics, effect of radiations and the significance of wave functions.	
UNIT	**CONTENT**	**HOURS**
Unit I	**CHEMICAL BONDING** Ionic bond – formation, variable electrovalency – Lattice energy, Born – Haber Cycle. Covalent bond - formation, variable covalency, maximum covalency, covalent character in ionic bond – Fajans Rule. Polarisation – partial ionic character of a covalent bond. VB theory, MO theory – Basic principles of bonding and antibonding orbitals, applications of MOT to H_2 He_2, N_2& O_2 – molecular orbital sequence, comparison of VB & MO Theories. Hybridisation – Formation of $BeCl_2$& BCl_3. VSEPR theory of simple inorganic molecules – $BeCl_2$, $SiCl_4$, PCl_5, SF_6, IF_7, XeF_6, BF_3& H_2O. Hydrogen bonding – Intermolecular & Intramolecular H_2 – bonding and consequences.	**18 Hrs**
Unit II	**CHEMISTRY OF s-BLOCK & ZERO GROUP ELEMENTS AND METALLURGY** General characteristics of s-block elements – comparative study of elements – alkali metals and theirhydroxides, oxides and halides, alkaline earth metals and their oxides, carbonates and sulphates. Diagonal relationship of Li & Mg, Be & Al, chemistry of NaOH, KI &Mg(NH4)PO4. **Metallurgy :**Occurrence of metals – concentration of ores – froth floatation, magnetic separation, calcination, roasting, smelting, flux, aluminothermic process, purification of metals – electrolysis, zone refining, van Arkel de-Boer process. **Zero group elements –** position in the periodic table, occurrence, isolation, applications, compounds of Xe – XeF_6& $XeOF_4$.	**18 Hrs**
Unit III	**CHEMISTRY OF BENZENE AND BENZENOID COMPOUNDS** Aromaticity – Huckle's rule - structure of benzene – Benzene-preparation, chemical properties and uses. Aromatic electrophilic substitution reactions and mechanism – Orientation and reactivity in substituted benzenes. Polynuclear aromatic hydrocarbons – Nomenclature, Naphthalene from coal tar and petroleum – Laboratory preparation, Structure of Naphthalene, Aromatic character, Physical properties, Chemical properties, Uses.	**18 Hrs**

	Mechanism of Aromatic electrophilic substitution – Theory of orientation and reactivity. Anthracene, Phenanthrene from coal tar and petroleum, Laboratory preparation, Molecular Orbital structures, Aromatic Characters, Physical Properties, Chemical properties and uses. Preparation of biphenyls, Physical and Chemical properties and uses.	
Unit IV	**ALKYL AND ARYL HALOGENS** Nomenclature of haloalkanes – structure - general preparations of haloalkanes - physical and chemical properties and uses. Nucleophilic aliphatic substitution reaction mechanisms (S_N1 and S_N2) – Stereochemical aspects. Halobenzenes: Theory of orientation and reactivity - general preparation – properties - uses. Electrophilic and nucleophilic aromatic substitution reaction mechanisms.	**18 Hrs**
Unit V	**ATOMIC STRUCTURE AND BASIC QUANTUM MECHANICS** Rutherford's and Bohr's model an atom- Bohr's theory and origin of hydrogen spectrum. Sommerfield's extension of Bohr's theory.Electromagnetic radiation- definitions for, υ and velocity.Dualism of light -Particle nature of radiation- black body radiation and Planck's quantum theory,photoelectric effect and Compton effect of matter.De Broglie hypothesis and Davisson and Germer experiment. Heisenberg's uncertainty principle. Schrodinger wave equation (Derivation not needed). Physical significance of $\Psi$and Ψ^2.	**18 Hrs**
Unit VI Self Study	Calculation of Bond Order & Determining stability of homo and hetero diatomic molecules.	

Text Book:

1.J.D.Lee , " Concise Inorganic Chemistry", Sultan Chand and Sons, 20th revised edition, 2000.
2. B.S. Bahl and Arun Bahl, " Advanced Organic Chemistry , New Delhi, Sultan Chand and Co.,(22th edition) (2016)
3. B.R.Puri,L.R. Sharma ,K.K. Kalia principles of Inorganic chemistry. New edition: Shoban Lal Nagin chand and co. 35thedition , 2013.

Reference Books:

1. R.D. Madan, "Modern Inorganic Chemistry", 2nd edition, S. Chand & Company Ltd., 2000.
2. P.L. Soni, "Text book of Inorganic Chemistry", 20th revised edition, Sultan Chand & Sons, 2000.
3. B.R. Puri, L.R. Sharma, K.K. Kalia, Principles of Inorganic Chemistry, 23rd edition, New Delhi, Shoban Lal Nagin Chand & Co., (1993).
4. J.D. Lee, 'Concise Inorganic Chemistry', 20th revised edition, Sultan Chand & Sons, 2000.
5. R. Gopalan, P.S. Subramanian & K. Rengarajan, "Elements of Analytical Chemistry", 2nd edition, Sultan Chand & Sons, 1991.

Web- Resources:

1. https://www.topfreebooks.org.
2. https://bookboon.com.
3. https://www.e-booksdirectory.com

Course Outcomes:
On completion of the course the learner will be able

CO 1:	The learners are able to predict the geometry of molecule.
CO 2:	To equip the learners with concepts of s block elements through comparative study
CO 3:	To know about the reaction mechanisms of aromatic and heterocyclic compounds.
CO 4:	To know about the chemistry of Halogens.
CO 5:	To know the fundamental concepts of atomic structure and basics of quantum mechanics.

Mapping of Course Outcomes with Programme Outcomes / Programme Specific Outcomes:

CO/PO	PO					**PSO**							
	1	2	3	4	5	1	2	3	4	5	6	7	8
CO1	S	S	S	W	S	S	S	W	W	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	M	S	S	S	W	W	S	S	S	S
CO5	S	S	S	W	W	S	S	S	M	S	S	S	S

S - Strongly Correlated

M - Moderately Correlated

W -Weakly Correlated

N – No Correlation

Semester-III / Core Course-III	**GENERAL CHEMISTRY –III**	Course Code: QUD
Instruction Hours: 6	Credits: 6	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100

Cognitive Level	**K1-Recalling** **K2-Understanding** **K3-Applying** **K4-Analyzing** **K5-Evaluating** **K6-Creating**	
Course Objectives	• To learn the chemistry of p-block elements. • To study about the preparations and properties of interhalogen compounds. • To understand the arrangement of atoms in space, isomers and their nomenclature. • To learn about the gas laws, properties of real gases and types of molecular velocities. • To learn the types, structure and properties of solids and liquid crystals.	
UNIT	**CONTENT**	**HOURS**
Unit I	**CHEMISTRY OF p-BLOCK ELEMENTS** **General characteristics of p-block elements.** Comparative study of elements of III A & their compounds. Compounds of boron –boric acid, borax, borazole. **Extraction of Al and Pb -** alums, alloys of Al. Chemistry of oxides of carbon – CO, CO_2. Allotropic forms of carbon. **Compounds of nitrogen and phosphorous –** $NH_2.NH_2$, H_2NOH, hydrazoic acid, N_2– Cycle, fixation of N_2, PH_3 and P_2O_5.	**18 Hrs**
Unit II	**INTERHALOGEN COMPOUNDS** Peracids of sulphur, Thionic acids, sodium thiosulphate – preparation, properties, structure and uses.Classification of oxides – acidic, amphoteric, neutral oxides, peroxidesandsuperoxides. Interhalogen compounds, Pseudohalogens, Oxyacids of halogens, Polyhalides and basic nature of iodine.	**18 Hrs**
Unit III	**STEREOCHEMISTRY** **Principles of symmetry –** symmetry elements (Cn, Ci and Sn) - asymmetry and dissymmetry – isomerism – constitutional isomers - stereoisomers – enantiomers – diastereomers - geometrical isomerism – meso and dl compounds - conventions used in stereochemistry: Newman, Sawhorse and Fischer notations and their interconversions. **Nomenclature, correlation of configuration –** Cahn-Ingold-Prelog rules for simple molecules - R,S and D,L notations to express configurations - chirality - optical isomerism - optical activity – polarimeter – specific rotation - stereochemistry of allenes and spiranes **Atropisomerism-** erythro and threo conventions – stereoselectivity, stereospecificity in organic reactions with examples. Resolution of racemic mixture– Walden Inversion – conformational analysis of cyclohexane - asymmetric induction.	**18 Hrs**
Unit IV	**GASEOUS STATE** **Gases –** Boyle's law, Charle's law and Avagadro's law- ideal gas equation.**Real Gases-** deviation from ideal behaviour – van der Waals equation of states- derivation – significance of critical constants- law of	**18 Hrs**

	corresponding states-compressibility factor. **Inversion temperature and liquefaction of gases-** Linde and Claude – demagnetization methods. **Maxwell's distribution of molecular velocities** (Derivation not needed).Types of molecular velocities- mean, most probable and root mean square velocities-Inter relationships. Collision diameter, mean free path and collision number.	
Unit V	**SOLID STATES AND LIQUID CRYSTALS** **Classification of solids-** Isotropic and anisotropic crystals- elements of symmetry-basic seven crystal systems- laws of crystallography-representation of planes-miller indices, space lattice and unit cell. **X-ray diffraction- derivation of Bragg's equation-** determination of structures of NaCl by Debye Scherrer (powder method) and rotating crystal methods. Types of crystals, close packing of identical solid spheres, interstitial sites, limiting radius ratios (derivation not needed), radius ratio rule and shapes of ionic crystals, structures of NaCl, CsCl and ZnS. **Semiconductors-**intrinsic and extrinsic semi conductors- n and p-type semiconductors.Liquid crystals- types and applications.	**18 Hrs**
Unit VI Self Study	Coordination numbers of cations and anions in ionic crystals from radius ratio Unit Cell diagrams of crystal structures.	

Text Book:

1. B.R.Puri,L.R.Sharma, K.K.Kalia, Principles of Inorganic Chemistry,23rd edition, New Delhi, Shoban Lal Nagin Chand & Co., (1993).
2. Bahl, B.S. and Bahl, A., Advanced Organic Chemistry,(12th edition), New Delhi, Sultan Chand &Co., (2010).
3. BahlB.S.,ArunBahl and Tuli G.D.(2012).Essential of Physical Chemistry,New Delhi: Sultan Chand and sons.

Reference Books:

1. B.R. Puri, L.R. Sharma, K.K. Kalia, Principles of Inorganic Chemistry, 23rd edition, New Delhi, Shoban Lal Nagin Chand & Co., (1993).
2. R.D. Madan, "Modern Inorganic Chemistry", 2nd edition, S. Chand & Company Ltd., 2000.
3. J.D. Lee, 'Concise Inorganic Chemistry', 20th revised edition, Sultan Chand & Sons, 2000.
4. Gurdeep Raj, 'Advanced Inorganic Chemistry', 20th revised edition, Sultan Chand & Sons, 2000.
5. Morrison R.T. and Boyd R.N., Bhattacharjee S. K. Organic Chemistry (7th edition), Pearson India, (2011).

Web- Resources:

1. https://www.topfreebooks.org.
2. https://bookboon.com.
3. https://www.e-booksdirectory.com

Course Outcomes:
On completion of the course the learner will be able

CO 1:	To equip the learners with concepts of p block elements through comparative study.
CO 2:	Physical and chemical properties of Pseudo halogen and Interhalogen compounds.
CO 3:	Aware of the fundamental aspects of stereochemistry.
CO 4:	To understand the aspects of gaseous state
CO 5:	Learn about solids, their properties, close packing in crystals, use of X-rays in crystal structure determination and Properties of Liquid Crystal.

Mapping of Course Outcomes with Programme Outcomes / Programme Specific Outcomes:

CO/PO	PO					**PSO**							
	1	2	3	4	5	1	2	3	4	5	6	7	8
CO1	S	S	S	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	M	S	S	S	S	M	S	S	S	S
CO3	S	S	S	M	S	S	S	S	M	S	S	S	S
CO4	S	S	S	W	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S	S	S	S

S - Strongly Correlated

M - Moderately Correlated

W -Weakly Correlated

N – No Correlation

Semester-III / **NON MAJOR ELECTIVE I**	**CHEMISTRY OF CONSUMER PRODUCTS**	Course Code:QUE1
Instruction Hours: 2	Credits: 2	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100

Cognitive Level	**K1-Recalling** **K2-Understanding** **K3-Applying** **K4-Analyzing** **K5-Evaluating** **K6-Creating**	
Course Objectives	• To know the preparation and applications of different types of soap. • To learn about the composition of Shampoos, Conditioners, Powder, Nail polish and Lipstick. • To gain knowledge about constituents and functions of Paint and Varnish. • To learn about preparation and applications of various dyes. • To know the preparation and uses of synthetic plastics, Resins and Rubber.	
UNIT	**CONTENT**	**HOURS**
Unit I	**SOAPS AND DETERGENTS** Manufacture of soaps, formulation of toilet soaps – different ingredients used- Soft soaps, shaving soaps and creams. Anionic detergents – manufacture and applications - cationic detergents – manufacture and applications.	**6Hrs**
Unit II	**COSMETICS** Shampoos – different kinds of shampoos – anti – dandruff, anti – lice, herbal and baby shampoos hair dye – manufacture of conditioners - skin preparation – skin powder, nail polish, lipsticks.	**6Hrs**
Unit III	**PAINTS AND VARNISHES** Constituents and their function – types and applications.	**6Hrs**
Unit IV	**DYES** Classification – preparation and uses of alizarin, Indigo, Methyl orange, Phenolphthalein and Malachite green.	**6Hrs**
Unit V	**Plastics – Resins and Rubber** Synthetic resins and plastics, synthetic polymers – important basic plastics and uses - rubber, vulcanization.	**6Hrs**

Text Book:

1. Thangamma Jacob, A Text Book of Applied Chemistry for Home Science and Allied Sciences.
2. B.K.Sharma, Industrial Chemistry Goel Publishing House (1995).

Reference Books:

1. R. Norris Shreve, Chemical process Industries.
2. Jayashree Ghosh, Fundamental Concept of Applied Chemistry,1st Edition (2006) S. Chand Company Ltd., New Delhi.

Web- Resources:
1.https://www.topfreebooks.org.
2.https://bookboon.com.

Course Outcomes:
On completion of the course the learner will be able

CO 1:	To learn depth knowledge about soap and detergent. To make plastics and know about the properties and applications of plastics
CO 2:	How to manufacture cosmetics
CO 3:	To know the applications of paint and varnishes.
CO 4:	To acquire the basic knowledge of classification, preparation and uses of dyes.
CO 5:	To make plastics and know about the properties and applications of plastics

Semester-III&IV / Core Course-II (Practical)	**SEMIMICRO ANALYSIS (P)**	Course Code: QUEY
Instruction Hours: 3	Credits: 3	Exam Hours: 3
Internal Marks -40	External Marks-60	Total Marks: 100

Course Objectives:

- To learn the techniques of semi micro qualitative analysis of Inorganic Salt mixtures.
- To become familiar with elimination of interfering acid radicals.

	SEMIMICRO INORGANIC QUALITATIVE ANALYSIS
	Analysis of a mixture containing two cations and two anions of which one will be an interfering acid radical. Semimicro methods using the conventional scheme with hydrogen sulphide may be adopted. Cations to be studied: Lead, Copper, Bismuth, Cadmium, Iron, Aluminium, Zinc, Manganese, Cobalt, Nickel, Barium, Calcium, Strontium, Magnesium and Ammonium. Anions to be studied : Carbonate, Sulphide, Sulphate, Nitrate, chloride, Bromide, Fluoride, Borate, Oxalate and Phosphate

Text Book:

2. V.Venkateshwaran,R.Veeraswamy, A.R.Kulandaivelu Basic Principles of Practical Chemistry 2nd edition 1997

Reference Books:

1. G.Svehla- Vogel's Quantitative Inorganic Analysis 7th edition Pearson education Ltd.
2. J.Mendham, R.C. Denney, J.D. Barnes &M.J.K.Thomas- Vogel's Textbook of quantitative chemical analysis 6th edition Pearson education Ltd.

Web- Resources:

1. https://www.bookrix.com.

Course Outcomes:

On completion of the course the learner will be able

CO 1:	Familiarize the test involving identification of Cations and Anions.
CO 2:	To know the techniques for elimination of acid radicals.

Marks Distributed for External:	Practical - Record -	55 Marks 05 Marks
4 Radicals correct with suitable tests	-	55 Marks
3 Radicals correct with suitable tests	-	40 Marks
2 Radicals correct with suitable tests	-	30 Marks
1 Radicals correct with suitable tests	-	15 Marks
Spotting	-	05 Marks

Mapping of Course Outcomes with Programme Outcomes / Programme Specific Outcomes:

CO/PO	PO					**PSO**							
	1	2	3	4	5	1	2	3	4	5	6	7	8
CO1	S	S	S	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S	S	S	S

S - Strongly Correlated

M - Moderately Correlated

W -Weakly Correlated

N – No Correlation

Semester-IV / Core Course-IV	**GENERAL CHEMISTRY - IV**	Course Code: QUF
Instruction Hours: 5	Credits: 5	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100

Cognitive Level	**K1-Recalling** **K2-Understanding** **K3-Applying** **K4-Analyzing** **K5-Evaluating** **K6-Creating**	
Course Objectives	• To learn about the compounds of d- and f- block elements. • To study about preparation, properties and uses of organ metallic compounds. • To know the chemical processes involved in the preparation, chemical conversion and application of alcohol, phenol and ethers. • To learn the thermodynamic principle and thermo chemistry aspects. • To study about rate of chemical reaction and theories of reaction rates.	
UNIT	**CONTENT**	**HOURS**
Unit I	**d-BLOCK & f-BLOCK ELEMENTS** General characteristics of d-block elements, comparative study of zinc group elements. Extraction of Mo and Pt – Alloys of copper, amalgams and galvanization. Evidences for the existence of Hg^{2+} ions General characteristics of f-block elements – Lanthanides Electronic configuration – oxidation states – ionic radii, lanthanide contraction. Colour and magnetic properties. Extraction of mixture of lanthanides from monazite sand and separation of lanthanides. Uses of lanthanides. Actinides Sources of actinides – preparation of transuranic elements - electronic configuration – oxidation states – ionic radii – colour of ions – comparison with lanthanides. Extraction of thorium from monazite sand. Production and uses of plutonium.	**15Hrs**
Unit II	**CHEMISTRY OF ORGANOMETALLIC COMPOUNDS** Introduction – Preparation of organomagnesium compounds – physical and chemical properties – uses. Organozinc compounds – general preparation, properties and uses. Organolithium, Organocopper compounds – Preparation, properties and uses.Organolead, Organophosphorous and organoboron compounds – Preparation, properties and uses.	**15Hrs**
Unit III	**UNIT III CHEMISTRY OF ALCOHOLS, PHENOLS AND ETHERS** Nomenclature – Individual source of alcohols – preparation of alcohols: hydration of alkenes, oxymercuration, hydroboration, Grignard addition, reduction – Physical, chemical properties and uses- Glycols from dihydroxylation, reduction, substitution reactions and glycerols and their uses. Preparation of Phenols including di- and trihydroxy phenols – Physical and chemical properties – uses- aromatic electrophilic substitution mechanism – theory of orientation and reactivity. Preparation of ethers: dehydration of alcohols, Williamsons synthesis – silyl ether, epoxide from peracids – Sharpless asymmetric epoxidation – reactions of epoxides – uses – introduction to crown ethers – structures – applications.	**15Hrs**

Unit IV	**UNIT IV THERMODYNAMICS I** Definitions – System and Surround – isolated, closed and open system – state of the system- intensive and extensive variables. Thermodynamic processes – reversible and irreversible, isothermal and adiabatic processes – state and path functions. Work of expansion at constant pressure and at constant volume, First law of thermodynamics – statement – definition of internal energy (E), enthalpy (H) and heat capacity. Relationship between Cp and Cv. Calculation of w, q, dE and dH for expansion of ideal and real gases under isothermal and adiabatic conditions of reversible and irreversible processes. Thermo chemistry – relationship between enthalpy of reaction at constant volume (q_v) and at constant pressure (q_p) – temperature dependence of heat of reaction – Kirchoff's equation – bond energy and its calculation from thermo chemical data-integral and differential heats of solutions and dilution**.**	**15Hrs**
Unit V	**CHEMICAL KINETICS** Rate of reaction -rate equation, order and molecularity of reaction. Rate laws – rate constants – derivation of first order rate constant and characteristics of zero order, first order and second order reaction – derivations of time for half change ($t_{1/2}$) with examples. Methods of determination of order of reactions – experimental methods – determination of rate constant of a reaction by volumetry, colorimetry and polarimetry. Effect of temperature on reaction rate – concept of activation energy, energy barrier. Arrhenius equation. Theories of reaction rates – collision theory – derivation of rate constant of bimolecular reaction – failure of collision theory – Lindemann's theory of unimolecular reaction. Theory of absolute reaction rate – derivation of rate constant for a bimolecular reaction – significance of entropy and free energy of activation. Comparison of collision theory and Absolute Reaction Rate Theory (ARRT).	**15Hrs**
Unit VI Self Study	Derivation of Critical Constant in terms of Vanderwaals constant	

Text Book:

1. R.D. Madan, "Modern Inorganic Chemistry", 2nd edition, S. Chand & Company Ltd., 2000. (Unit – I & II)
2. Bahl B.S. and Bahl A., Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (2010). (Unit-III)
3. Puri B.R., Sharma L.R. and Pathania M.S. Principles of Physical Chemistry, (35th edition), New Delhi: Shoban Lal Nagin Chand and Co. (2013) (Unit-IV &V)

Reference Books:

1.B.R. Puri, L.R. Sharma, K.K. Kalia, Principles of Inorganic Chemistry, 23rd edition, New Delhi, Shoban Lal Nagin Chand & Co., (1993).
2. J.D. Lee, 'Concise Inorganic Chemistry', 20th revised edition, Sultan Chand & Sons, 2000.
3. Morrison R.T. and Boyd R.N., Bhattacharjee S. K. Organic Chemistry (7th edition), Pearson India, (2011).
4. Samuel Glasstone, Thermodynamics for Chemists (3rd printing), East- West Edn. (1974)
5. Puri B.R., Sharma L.R. and Pathania M.S., Principles of Physical Chemistry, (35th edition), New Delhi: Shoban Lal Nagin Chand and Co. (2013)

Web- Resources:

1. http://www.webelements.com
2. https://www.topfreebooks.org.
3. http://www.lib.utexas.edu/thermodex
4. https://www.e-booksdirectory.com

Course Outcomes:

On completion of the course the learner will be able

CO 1:	To learn about the compounds of d and f-block elements.
CO 2:	To acquire the knowledge of preparation, properties and uses of Organo metallic compounds.
CO 3:	To know the chemical processes involved in the preparation of alcohols and ethers.
CO 4:	To learn the thermodynamic principles and thermo chemistry aspects.
CO 5:	To gain knowledge about the rate of chemical reaction and its theory.

Mapping of Course Outcomes with Programme Outcomes / Programme Specific Outcomes:

CO/PO	PO					**PSO**							
	1	2	3	4	5	1	2	3	4	5	6	7	8
CO1	S	S	S	W	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	M	S	S	S	S	S	W	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S	S	S	S

S - Strongly Correlated

M - Moderately Correlated

W -Weakly Correlated

N – No Correlation

Semester-IV / **SKILL BASED ELECTIVE – I**	**PHARAMACEUTICAL CHEMISTRY**	Course Code: QUS1
Instruction Hours: 2	Credits: 2	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100

Cognitive Level	**K1-Recalling** **K2-Understanding** **K3-Applying** **K4-Analyzing** **K5-Evaluating** **K6-Creating**	
Course Objectives	• To learn the terminology and routes of administration of drug. • To learn the use of Indian Medicinal plants. • To know about designation of drugs • To know about common body ailments and treatment. • To gain knowledge in vitamins, micronutrients and antioxidant.	
UNIT	**CONTENT**	**HOURS**
Unit I	**INTRODUCTION** Common diseases – Infective diseases – insect – borne, and water- borne – hereditary diseases – Terminology – drug , pharmacology , pharmacognosy , pharmacodynamics , pharmacokinetics, antimetabolic. Absorption of drugs – routes of administration of drugs , factors affecting absorption –Assay of drugs – chemical , biological , immunological assays.	**6Hrs**
Unit II	**DRUGS** Various sources of drugs , pharmacologically active constituents in plants. Indian medicinal plants – tulsi , neem , keezhanelli – their importance. Classification of drugs – biological chemical – mechanism of drug action – action at cellular and extra cellular sites.	**6Hrs**
Unit III	**CHEMOTHERAPY** Designation of drugs based on physiological action , Definition and two examples each of Anesthetics – General , IV and local – Analgesics – Narcotic and synthetic – Antipyretic and anti inflammatory agents – Antibiotics – penicillin , streptomycin, chloramphenicol, tetracyclines – Antivirals . AIDS – symptoms , prevention , treatment.	**6Hrs**
Unit IV	**COMMON BODY AILMENTS** Diabetes – causes , hyper and hypoglycemic drugs. Blood pressure – Sistolie& Diastolic Hypertensive drugs – Cardiovascular drugs – antiarrhythmic , antianginals , vasodilators. CNS depressants and stimulants – Psychedelic drugs , hypnotics , sedatives (barbiturates , LSD).	**6Hrs**
Unit V	**HEALTH PROMOTING DRUGS** Nutrients – Vitamins A, B, C, D, E and K. Micronutrients Na, K, Ca, Cu, Zn and I – Medically important inorganic compounds of Al P AS Hg Fe- L examples each their role and application. Organic Pharmaceutical acids , Agents for pilitary function (metyrapone) – Organic pharmaceutical bases – antioxidants .	**6Hrs**

Text Book:

1. JayasreeGhose , Pharmaceutical chemistry , S,Chand and Company Ltd ., New Delhi, 2006.
2. Lakshmi S.,Pharmaceutical chemistry , S.Chand& and sons , New Delhi,1995.

Reference Books:

1. Ashutosh Kar , Medicinal chemistry , Willey Eastern Ltd ,. New Delhi,1993.
2.David William & Thomas Lemke ,Foyes principles of medicinal chemistry , 5th edition Bl publishers, 2005 .
3.Romas Nogrady , Medicinal chemistry , II Edition, Oxford Univ.Press, 2004.
4. Cherilyn Tilman, "Principles of Occupational Health and Hygiene-an introduction" Allen and Unwin, Sydney, 2007.
5. Fryer, Jane Eayre, " FirstAid Book", John C.Winston Company.

Web- Resources:

1. https://www.topfreebooks.org.
2. https://bookboon.com.
3.

Course Outcomes:

On completion of the course the learner will be able

CO 1:	To know the terminology in Pharmaceutical chemistry.
CO 2:	To understand the assay of drugs, administration ofdrugs.
CO 3:	To classify drugs based on biological and chemical methods.
CO 4:	To recognize the chemotherapy of some common diseases.
CO 5:	To learn depth concepts of nutrients and organic pharmaceutical aids.

Mapping of Course Outcomes with Programme Outcomes / Programme Specific Outcomes:

CO/PO	PO					**PSO**							
	1	2	3	4	5	1	2	3	4	5	6	7	8
CO1	S	S	S	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S	S	S	S

S - Strongly Correlated

M - Moderately Correlated

W -Weakly Correlated

N – No Correlation

Semester-VI / **Non Major Elective – II**	**Food Science**	Course Code: QUE2
Instruction Hours: 2	Credits: 2	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100

Cognitive Level	**K1-Recalling** **K2-Understanding** **K3-Applying** **K4-Analyzing** **K5-Evaluating** **K6-Creating**	
Course Objectives	• To learn the importance of food and nutritional care • To study the biological functions of food • To understand the constituents of food • To acquire knowledge about adulteration in food. • To understand health problems due to food adulterants.	
UNIT	**CONTENT**	**HOURS**
Unit I	**FOOD NUTRITION** Food, Nutrition and Health – The meaning of food nutrition, nutritional care and health - Nutritional problems in India.	**6Hrs**
Unit II	**BIOLOGICAL IMPORTANCE** Biological importance of food – Nutritional classification of food – nutrients as body constituents – digestion and absorption of food, caloric content and dieting.	**6Hrs**
Unit III	**CONSTITUENT OF FOOD** Basic chemical constituents of food – Biological functions of carbohydrates, proteins, fats, vitamins, minerals and water.	**6Hrs**
Unit IV	**FOOD ADULTERATION** Food adulterants testing – common adulterants in food – testing methods of all food adulterants.	**6Hrs**
Unit V	**HEALTH EFFECTS** Health Problems of food adulteration – Principal adulterants and their health effects.	**6Hrs**

Text Book:

1. Alex Ramani V– Food Chemistry, MJP Publishers, Tripilcane, Chennai, 2009.
2. Thang Jacob, Food adulteration, Mac Millan company of India Ltd., New India, 1976.

Reference Books:

1.Jeyaramanj, Laboratory manual in biochemistry, Wiley eastern Ltd., New Delhi, 1981.
2.B.Srilakshmi, " Food Science", 3rd edition, New age International (P) Ltd., New Delhi, 2005.
3.B.Srilakshmi, " Nutrition Science", 1st edition, New age International (P) Ltd., New Delhi.
4.Swaminathan M, "Food Science and Experimental Foods", Ganesh & Company.
5.Corrinne H.Robinson, " Fundamentals of normal nutrition", Mac Millan Company of India Ltd., New Delhi.

Web- Resources:

1. https://www.topfreebooks.org.
2. https://bookboon.com.

Course Outcomes:

On completion of the course the learner will be able

CO 1:	Knowledge of food nutrition, health and awareness of nutritional problems in India.
CO 2:	To analyze the biological importance and nutritional classification of food.
CO 3:	To learn depth knowledge about constituent, biological functions of carbohydrates, proteins, fats, vitamins, minerals and water
CO 4:	To identify the adulterants, present in food and their testing methods.
CO 5:	To be able to recognize the principal adulterants and their health effects.

Mapping of Course Outcomes with Programme Outcomes / Programme Specific Outcomes:

CO/PO	PO					**PSO**							
	1	2	3	4	5	1	2	3	4	5	6	7	8
CO1	S	S	S	W	S	S	S	S	S	W	S	M	S
CO2	S	S	S	S	S	S	S	S	S	M	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	W	S	S	S

S - Strongly Correlated

M - Moderately Correlated

W -Weakly Correlated

N – No Correlation

Semester-V / Core Course-V	**INORGANIC CHEMISTRY-I**	Course Code: QUG
Instruction Hours: 5	Credits: 5	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100

Cognitive Level	**K1-Recalling** **K2-Understanding** **K3-Applying** **K4-Analyzing** **K5-Evaluating** **K6-Creating**	
Course Objectives	• Students understand the concept of isomerism in coordination compounds their structural and magnetic properties. • Students study about the theories of coordination compounds. • Students learn about types of reactions of complexes and their mechanism and learn about Jahn teller effect and chelate effect. • Students learn about the preparation, properties, structure, bonding and uses of carbonyl, borides, carbides and nitrides. • Students learn about classification, preparation, properties, structure, magnetic properties and application of dipole moment of Nitrosyl Compounds.	
UNIT	**CONTENT**	**HOURS**
Unit I	**COORDINATION COMPOUNDS-I** Introduction- Types of ligands: unidentate, bidentate and poly dentate ligands, chelating ligands and chelates- IUPAC nomenclature of coordination compounds. Isomerism in coordination compounds: Structural isomerism, hydrate isomerism, co ordination isomerism, ionisation isomerism, linkage isomerism, coordination position isomerism. Stereoisomerism: Geometrical isomerism of four and six coordinate complexes, optical isomerism of four and six coordinate complexes, Werner and sidgwick theories, methods of detecting complex formation.	**15Hrs**
Unit II	**COORDINATION COMPOUNDS-II** Theories of coordination compounds: Valence bond theory, limitations of valence bond theory, crystal field theory – splitting of d orbitals in octahedral, tetrahedral and square planar fields, CFSE, factors affecting CFSE, colour, geometry and magnetic properties of coordination compounds, Jahn – Teller distortion (an elementary idea). Molecular orbital theory : Molecular orbital diagram for $[Co(NH_3)]^{3+}$. Ligand field theory. (An elementary treatment only).	**15Hrs**
Unit III	**COORDINATION COMPOUNDS-III** Labile and inert complexes, stability of coordination compounds- thermodynamic and kinetic stability, relationship between stepwise formation constant and overall formation constant, factors affecting the stability of complexes. Unimolecular and bimolecular nucleophilic substitution reactions in octahedral and square planar complexes, trans effect- theories of trans effect and applications. A few biologically important coordination compounds: Chlorophyll, haemoglobin and vitamin B_{12}	**15Hrs**

Unit IV	**CARBONYLS AND BINARY METALLIC COMPOUNDS** Metal carbonyls: Mono and binuclear carbonyls of Ni, Fe, Cr, Co and Mn- preparation, structure, reactions, bonding and uses.Structure and bonding in metal alkenyl and metal alkyl complexes of $[PtCl_3(C_2H_4)]$-,$[Co(CO)_6(RC\ CR)]$ and ferrocene.Binary metallic compounds: borides, carbides, hybrides and nitrides- classification, preparation, properties and uses.	**15Hrs**
Unit V	**NITROSYL COMPOUNDS AND MAGNETIC PROPERTIES** Nitrosyl compounds: Classification- nitrosyl chloride and sodium nitroprusside- preparation,properties and structure. Magnetic properties-meaning of the terms-magnetic susceptibility- magnetic moment-types of magnetism-Gouy balance-applications of magnetic properties Dipolemoment- determination, application in the study of simple inorganic molecules.	**15Hrs**
Unit VI Self Study	Survey of Common mono denate and bi denate ligand.	

Text Book:

1.R.D. Madan, "Modern Inorganic Chemistry", 2nd edition, S. Chand & Company Ltd., 2000.
2.P.L. Soni, 'Text Book of Inorganic Chemistry', 20th revised edition, Sultan Chand & Sons, 2000.

Reference Books:

1. W.U. Malik, G.D. Tuli and R.D. Madan, S.Chand and Company Ltd., 'Selected topics in Inorganic Chemistry',
7th edition, 2001.
2.Gopalan R, Text Book of Inorganic Chemistry, 2nd Edition, Hyderabad, Universities Press, (India), 2012.
3.B.R. Puri, L.R. Sharma, K.C. Kalia, 'Principles of Inorganic Chemistry', 21st edition, Vallabh Publications, 2004-2005.
4.J.E. Huheey, 'Inorganic Chemistry', 4th edition, Pearson Education. Inc. 1993.
5.F.A. Cotton, 'Advanced Inorganic Chemistry', 6th edition, John Wiley & Sons, Pvt. Ltd., 2003 – 2004.

Web- Resources:

1.https://www.chemheritage.org/
2. http://www.chemspider.com/

Course Outcomes:

On completion of the course the learner will be able

CO 1:	Understand the types of ligands & isomerism.
CO 2:	Recognize the splitting of orbitals.
CO 3:	Know the importance of coordination compounds.
CO 4:	Recognize the structure and bonding of carbonyls and binary metallic compounds.
CO 5:	Predict the magnetic properties of coordination compounds.

Mapping of Course Outcomes with Programme Outcomes / Programme Specific Outcomes:

CO/PO	PO					**PSO**							
	1	2	3	4	5	1	2	3	4	5	6	7	8
CO1	S	S	S	W	S	S	S	S	S	S	S	S	S
CO2	S	S	S	M	M	S	S	S	M	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S	S	S	S

S - Strongly Correlated

M - Moderately Correlated

W -Weakly Correlated

N – No Correlation

Semester-V / Core Course-VI	**ORGANIC CHEMISTRY I**	Course Code: QUH
Instruction Hours: 5	Credits: 5	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100

Cognitive Level	**K1-Recalling** **K2-Understanding** **K3-Applying** **K4-Analyzing** **K5-Evaluating** **K6-Creating**	
Course Objectives	• A Comprehensive knowledge and understanding on the carbonyl compounds and Nitrogen compounds. • To acquire knowledge in carboxylic acids. • Specialized students with in depth knowledge in functional group inter conversion. • Students acquire the knowledge about heterocyclic compounds and chemistry of dyes. • Students learn about redox reagents and their application.	
UNIT	**CONTENT**	**HOURS**
Unit I	**CHEMISTRY OF CARBONYL COMPOUNDS** Nomenclature – structure of carbonyl compounds- chemical properties- nucleophilic addition mechanism at carbonyl group (eg: HCN,ROH,RNH_2) – acidity of alpha hydrogen- keto- enol Tautomerism (proof for the two forms) Reduction and oxidation reactions of carbonyl compounds-paraformaldehyde, metaformaldehyde-uses of aliphatic carbonyl compound- Claisen condensation-Aldol condensation- Robinson annulations. General methods of preparation of aromatic carbonyl compounds-physical and chemical properties-uses-effect of aryl group on the reactivity of carbonyl group.	**15Hrs**
Unit II	**CHEMISTRY OF CARBOXYLIC ACIDS** Nomenclature- Acidity of carboxylic acids based on substituent effect- comparison of acid strength of halogen substitute acetic acids- acid strengths of substituted benzoic acids- Acid derivatives- Nucleophilic substitution mechanism at acyl carbon. Preparation, properties and uses of acid derivatives: acid chloride, anhydrides, esters, amides- chemistry of compounds containing active methylene group- synthesis and synthetic applications of acetoacetic ester and malonic ester. Preparation of dicarboxylic acid- physical and chemical properties-uses. Introduction to oils and fats- fatty acids-manufacture of soap-mechanism of cleaning action of soap.	**15Hrs**

Unit III	**CHEMISTRY OF NITROGEN COMPOUNDS** Nomenclature- nitro alkanes- alkyl nitrites- differences- aromatic nitro compounds- preparation and reduction of nitro benzene under different conditions, TNT. Amines- effect of substituent's on basicity of alipahatic and aromatic amines- Reactions of amino compounds (primary, secondary, tertiary and quaternary amine compounds)-Mechanism of carbylamine's reaction, diazotization and comparison of aliphatic and aromatic amines. Diazonium compounds – preparation and synthetic applications of diazomethane, benzene diazonium chloride and diazo acetic ester.	**15Hrs**
Unit IV	**CHEMISTRY OF HETEROCYCLIC COMPOUNDS AND DYES** Introduction- nomenclature of heterocyclic compounds having not more than two hetero atoms such as oxygen, nitrogen and sulphur- structure, synthesis and properties of furan, pyrrole, thiophene. Pyridine- structure, preparation-compare the basicity of pyridine with pyrrole and amines. Quinoline- structure and Skraup synthesis. Isoquinoline- structure and Napieralski synthesis and Indole- structure and Fischer- indole syntheses. Dyes- color and constitution- chromophore- auxochrome- classification according to application and structure- preparation and uses of – methyl orange, fluorenscein, Alizarin, Indigo and malachite green dyes.	**15Hrs**
Unit V	**UNIT V OXIDATION AND REDUCTION** Oxidation: Osmium tetroxide- Chromyl chloride – Ozone-DDQ-Dioxiranes. Lead tetraacetate- selenium dioxide-DMSO either with Ac_2O or oxalyl chloride-Dess- Martin reagent. Reduction: Catalytic hydrogenation using Wilkinson Catalyst- Reduction with LAH, $NaBH_4$, tritertiarybutoxy aluminum hydride, $NaCNBH_3$, hydrazines	**15Hrs**
Unit VI **Self Study**	Identify the resonance structures of heterocyclic compounds	

Text Book:

1. Morrison R.T. and Boyd R.N., Bhattacharjee S. K. Organic Chemistry (7th edition), Pearson India, (2011)
2. Bahl, B.S. and Bahl, A., Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., 2010.

Reference Books:

1. Finar I.L., Organic Chemistry, Vol 1&2, (6th edition) England, addison Wesley Longman Ltd. (1996).
2. Pine S.H., Organic Chemistry, (5th edition) New Delhi, McGraw – Hill International Book Company (1987)
3. Seyhan N. Ege, Organic Chemistry, (5th edition) New York, Houghton Mifflin Co., (2005)
4. Ahluwalia V.K., Rakesh Kumar Prashar, " Organic Reaction Mechanisms", (4th Edition), Alpha Science International., (2011).
5. Paula YurkanisBruice, "Organic Chemistry", (8th Edition), University of California, Santa Barbara, Pearson Ltd., (2011).

Web- Resources:
1.http://organicdivision.org/links.html
2. http://www.chemistryguide.org/

Course Outcomes:
On completion of the course the learner will be able to

CO 1:	Learn about the reduction and oxidation reaction of carbonyl compounds
CO 2:	Understand the preparation, properties and uses of carbonyl compounds
CO 3:	Know about the chemistry of Nitrogen compounds
CO 4:	Predict the structure of Heterocyclic compounds
CO 5:	Aware the types of oxidizing and reducing agents

Mapping of Course Outcomes with Programme Outcomes / Programme Specific Outcomes:

CO/PO	PO					**PSO**							
	1	2	3	4	5	1	2	3	4	5	6	7	8
CO1	S	S	S	S	S	S	S	S	M	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	M	S	S	S	S

S - Strongly Correlated

M - Moderately Correlated

W -Weakly Correlated

N – No Correlation

Semester-V / Core Course-VII	**PHYSICAL CHEMISTRY I**	Course Code: QUI
Instruction Hours: 6	Credits: 6	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100

Cognitive Level	**K1-Recalling** **K2-Understanding** **K3-Applying** **K4-Analyzing** **K5-Evaluating** **K6-Creating**	
Course Objectives	• Students gain knowledge in Photo chemistry and Group theory. • Students understand the efficient way of converting work into energy and vice versa from the thermodynamic perspective. • Students get to know the energy changes involved in the natural and the industrial processes – that are the applications of thermodynamics. • Students understand the method of enhancing the efficiency of the certain industrial processes. • Students learn about solutions, their types, colligative properties, effect of added salt and molecular weight determination.	
UNIT	**CONTENT**	**HOURS**
Unit I	**PHOTOCHEMISTRY AND GROUP THEORY** Consequences of light absorption- Jablonski diagram- radiative and non-radiative transitions. Lambert's Beer law, quantum efficiency. Photochemical reactions- Comparison between thermal and photochemical reactions. Photosensitization and quenching. Fluorescence, Phosphorescence and chemiluminescence. Laser and uses of lasers Group theory- symmetry elements and symmetry operation- group postulates and types of groups- abelian and non abelian- symmetry operation of H_2O molecule. Illustration of group postulates using symmetry operation of H_2O molecule-construction of multiplication table for the operation of H_2O molecules -point group- definition- elements symmetry operations of the following molecules- H_2O,BF_3 and NH_3.	**18Hrs**
Unit II	**THERMODYNAMICS II** Second law of thermodynamic – need for the law – different statements of the law- Carnot cycle and efficiency of heat engine- Carnot's theorem-thermodynamic scale of temperature. Concept of entropy- definition and physical significance of entropy- entropy as a function of P,V and T – entropy changes during phase changes – entropy of mixing- entropy criterion for spontaneous and equilibrium processes in isolated system. Gibb's free energy(G) and Helmoholtz free energy (A)- variation of A and G with P,V and T-Gibb's- Helmholtz equation and its applications. Thermodynamics equation of state, Maxwell's relations-A and G as criteria for spontaneity and equilibrium.	**18Hrs**

Unit III	**THERMODYNAMICS III** Equilibirum constant and free energy change- thermodynamic derivation of law of mass action- equilibrium constants in terms of pressure and concentraation-NH_3,PCl_5 and $CaCO_3$. Thermodynamic interpretation of Lechatelier's principle (Concentration, temperature, pressure and addition of inert gases). System variables composition- partial molar quantities- chemical potential- variation of chemical potential with T, P and X (mole fraction)- Gibb's Duhem equation. Van't Hoff's reaction isotherm- van't Hoff's isochore. Clapeyron equation and Clausis- Clapeyron equation-applications. Third law of thermodynamics- Nernst heat theorem. Statement of III law and concept of residual entropy- evaluation of absolute entropy from heat capacity data.	**18Hrs**
Unit IV	**SOLUTIONS** Raoult's law, Henry's law,Ideal and non- ideal solutions, completely miscible liquid systems-benzene and toluene. Derivation from ;Raoult's law and Henry's law. DuhemMargules equation. Theory of fractional distillation. Azeotropes- HCl- water and ethanol-water system. Partially miscible liquids- phenol-water, triethylamine-water and nicotine-water systems. Lower and upper CSTs- effect of impurities on CST. Completely immiscible liquids- principle and applications of steam distillation. Nernst distribution law, derivation. Dilute solutions- colligative properties, relative lowering of vapour pressure, omosis, law of osmotic pressure, derivation of elevation of boiling point and depression in freezing point. Determination of molecular masses using colligative properties. Abnormal molecular masses, molecular dissociation- degree of dissociation- molecular association.	**18Hrs**
Unit V	**UNIT V PHASE CHANGES** Definition of terms in the phase rule- derivation and application to one component system- water and sulphur- super cooling, sublimation. Two- component systems- solid liquid equilibria, simple eutectic (lead-silver, Bi-Cd), desilverisation of lead. Compound formation with congruent melting point (Mg-Zn) and incongruent melting point (Na-K). Solid solutions-(Ag-Au)- fractional crystallization, freezing mixtures- $FeCl_3$-H_2O system, $CuSO_4$-H_2O system.	**18Hrs**
Unit VI Self Study	Calculation of Absolute Entropies	

Text Book:

1. Raman, K., Group theory and its application to Chemistry, New Delhi: Tata McGraw-Hill. (1990).
2. Puri B.R., Sharma L.R. and PathaniaM.S. , Principles of Physical Chemistry, (35th edition), New Delhi: Shoban Lal Nagin Chand and Co. (2013).

Reference Books:

1. Gurdeep Chatwal R, Photochemistry, Good publishing House.
2. Samuel Glasstone , Thermodynamics for Chemists (3rd printing), East- West Edn. (1974).
3. Glasstone S. and Lewis D., Elements of Physical Chemistry, London, Mac Millan & Co Ltd.
4. Atkins P.W. , Physical chemistry, (5th edition), Oxford University press. (1994).
5. Sangaranarayanan, M.V., Mahadevan, V., Text Book of Physical Chemistry, 2nd Edition, Hyderabad, Universities Press, (India) 2011.

Web- Resources:

1. http://www.lib.utexas.edu/thermodex
2. http://www.chemistryguide.org

Course Outcomes:

On completion of the course the learner will be able

CO 1:	Learn aboutPhotochemistry
CO 2:	Predict the symmetry elements and symmetryoperations
CO 3:	Apply the concept of Second law ofthermodynamics
CO 4:	Know the partial molarquantities.
CO 5:	Recognize the component system using phaserule.

Mapping of Course Outcomes with Programme Outcomes / Programme Specific Outcomes:

CO/PO	PO					**PSO**							
	1	2	3	4	5	1	2	3	4	5	6	7	8
CO1	S	S	S	M	S	S	S	S	M	S	S	S	S
CO2	S	S	S	M	M	S	S	M	S	S	S	S	S
CO3	S	S	S	M	S	S	S	S	S	W	S	S	S
CO4	S	S	S	S	S	S	S	S	M	M	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S	S	M	M

S - Strongly Correlated

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Semester-V / Core Practical-III **(PRACTICAL)**	**PHYSICAL CHEMIISTRY (P)**	Course Code: QUJY
Instruction Hours: 3	Credits: 3	Exam Hours: 3
Internal Marks -40	External Marks-60	Total Marks: 100

Course Objectives:

- Students shall learn the fundamentals of various physical experiments.
- Students shall understand the method of determination of critical solution temperature, transition temperature and rate constant.
- Students acquire knowledge and skills of drawing graph and handling of some precision instruments.

List of Experiments:

1. Critical Solution Temperature
2. Effect of impurity on Critical Solution Temperature
3. Transition Temperature
4. Rast Method
5. Phase Diagram (Simple eutectic system)
6. Kinetics of Ester Hydrolysis
7. Partition Co-efficient of iodine between water and carbon tetrachloride.
8. Conductometric Acid-Base Titration
9. Potentiometic Redox Titration
10. Determination of cell constant

Mark Distribution :	
External : 60	Internal : 40
Practical : 45	
Procedure Writing with formula : 10	
Record : 05	

Text Book:

Venkateswaran V, Veeraswamy R, Kulandaivelu A.R, "Basic Principles of Practical Chemistry", (2nd edition),Sultan Chand &Sons, New Delhi (1997).

Reference Books:

1. D.P. Shoemaker, C.W.Garland&J.W.Nibler, " Experiments in Physical Chemistry" 5th edition, McGraw Hill, 1989.
2.V.D.Athawala&P.Mathur, "Experimental Physical Chemistry", New age International publisher, 2001.
3. Findlay.A, " Practical Physical Chemistry", 7th edition, London, Longman, 1959.
4. Ahluwalia V.K,Dingra.S&Gulati.A, "College Practical Chemistry", Orient Longman Pvt Ltd., Hyderabad, 2005.

Web- Resources:

http://www.vlab.co.in/index.php

Course Outcomes:
On completion of the course the learner will be able

CO 1:	To understand the method of determination of critical solution temperature, transition temperature and rate constant.
CO 2:	To learn the fundamentals of conductometric titration

Mapping of Course Outcomes with Programme Outcomes / Programme Specific Outcomes:

CO/PO	PO					**PSO**							
	1	2	3	4	5	1	2	3	4	5	6	7	8
CO1	S	S	S	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S	S	S	S

S - Strongly Correlated

M - Moderately Correlated

W -Weakly Correlated

N – No Correlation

Semester-V / **MAJOR BASED ELECTIVE – I**	**ANALYTICAL CHEMISTRY**	Course Code:- QUE3
Instruction Hours: 5	Credits: 5	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100

Course Objectives:

Cognitive Level	**K1-Recalling** **K2-Understanding** **K3-Applying** **K4-Analyzing** **K5-Evaluating** **K6-Creating**	
Course Objectives	• Students shall learn the storage and handling of various chemicals and first aid procedures. • Students shall demonstrate competence in collecting and interpreting data from their knowledge on analytical techniques. • Students know the separation and purification technique of solvents. • Students learn about thermo gravimetric analysis, differential thermal analysis, analytical electrochemistry and its applications. • Students learn about colorimetric analysis, coulometry analysis and its application.	
UNIT	**CONTENT**	**HOURS**
Unit I	**LABORATORY HYGIENE & FIRST AID** Laboratory Hygiene and safety:Storage and handling of corrosive, flammable, explosive, toxic, carcinogenic and poisonous chemicals. Simple first aid procedure from accident:Acid in eye, alkali in eye, acid burns, alkali burns, bromine burns, poisoning, inhalation of gases, cut by glasses and heat burns**.**	**15Hrs**
Unit II	**DATA ANALYSIS** Errors in chemical analysis, classification of errors, determinant errors, instrumental errors, personal errors, constant errors, and proportional errors – correction of determinant errors, random errors . Precision, accuracy and rejection of data questioned. Significant figures. Mean and standard deviation. Curve fitting.	**15Hrs**
Unit III	**SEPARATION & PURIFICATION TECHNIQUE** General principles involved in the separation of precipitates. Solvent extraction**.** Chromatography: Principles involved in adsorption, partition and ion exchange, paper, thin layer, column, Electrophoresis applications. Desiccants, vacuum drying, distillation, fractional distillation, steam distillation, azotropic distillation, crystallization and sublimation – principles and techniques**.**	**15Hrs**
Unit IV	**THERMO ANALYTICAL METHODS &ANALYTICAL ELECTROCHEMISTRY** Thermo analytical Methods:Principles involved in TGA and DTA – instrumentation. Characteristics of TGA ($CaC_2O_4.H_2O$, $CuSO_4.5H_2O$) and DTA curves ($CaC_2O_4.H_2O$). Factors affecting TGA and DTA curves.Thermometric titration of HCl Vs NaOH Analytical Electrochemistry:Redox potential – measurement and applications. Interpretation of chemical behavior. Electrolytic separations. Principles of Electrodeposition. Electro gravimetric (estimation of Cu and Ag).	**15Hrs**

Unit V	**COLORIMETRIC ANALYSIS** Colorimetric analysis:Laws of colorimetry – instrumentation. Nessler's and photoelectric colorimetric method- operation and application. Estimation of Ni, Cu and Fe.Techniques in kinetics:Principles and techniques used to follow the kinetics of ordinary and fast- photochemical reactions.	**15Hrs**

Text Book:

1..R.Gopalan, P.S. Subramanian, and K. Rengarajan – "Elements of Analytical Chemistry", 2nd edition, Sultan chand&Co.,
2. Vogel.A" Text book of Quantitative Inorganic analysis", 4th edition, English language book society

Reference Books:

1. B.K. Sharma, " Instrumental methods of chemical analysis", Goel Publishing House, Merrut (1997).
2. Gurdeep Chatwal and Sham Anand , "Instrumental methods of chemical analysis" Himalaya publishing h (2005).
3. D.A. Skoog and D.M.West, "Fundamentals of analytical chemistry", 7th edition, Hartcourt College Publishers.
4. R.A. Day and A.L. Underwood – Quantitative analysis.
5. Mendham J, Denny R.C., Barnes J.D., Thomas M, " Vogel's Text book of quantitative chemical analysis",
6th edition, Pearson education.

Web- Resources:

1. http://www.chemexper.com

Course Outcomes:

On completion of the course the learner will be able

CO 1:	Aware of Laboratory hygiene and safety.
CO 2:	Predict the data analysis in analytical techniques
CO 3:	Learn about separation and purification techniques
CO 4:	.Recognize the thermo analytical methods such as TGA,DTA and analytical electrochemistry.
CO 5:	Understand the colorimetric analysis and techniques in kinetics.

Mapping of Course Outcomes with Programme Outcomes / Programme Specific Outcomes:

CO/PO	PO					**PSO**							
	1	2	3	4	5	1	2	3	4	5	6	7	8
CO1	S	S	M	S	S	S	S	S	M	W	S	W	S
CO2	S	S	S	M	S	S	S	S	S	W	S	S	S
CO3	S	S	S	S	S	S	S	S	M	S	S	S	S
CO4	S	S	S	M	S	S	S	S	M	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S	S	S	S

S - Strongly Correlated

M - Moderately Correlated

W -Weakly Correlated

N – No Correlation

Semester-V / **SKILL BASED ELECTIVE – II**	**APPLIED CHEMISTRY**	Course Code: QUS2
Instruction Hours: 2	Credits: 2	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100

Cognitive Level	**K1-Recalling** **K2-Understanding** **K3-Applying** **K4-Analyzing** **K5-Evaluating** **K6-Creating**	
Course Objectives	• Students learn about types and hardness techniques of water. • Students learn how to determine TDS,COD and BOD. • Students understand about the application of Leather Chemistry. • Students shall know about the physiochemical properties of milk. • Students understand about the constituent of diary products.	
UNIT	**CONTENT**	**HOURS**
Unit I	**WATER CHEMISTRY I** Water – types of water - soft and hard water – hardness, degree of hardness - Reverse osmosis and ion exchange methods – principles and techniques.	**6Hrs**
Unit II	**WATER CHEMISTRY II** Water Analysis - Determination of TDS, Total hardness by EDTA, BOD and COD.	**6Hrs**
Unit III	**LEATHER CHEMISTRY** Introduction, chief process used in leather manufacture, structure of hide and skin , leather processing – process before tannage – tanning process – vegetables tanning and chrome tanning.	**6Hrs**
Unit IV	**DIARY CHEMISTRY I** Milk – Definition, physiochemical properties of milk, constituents of milk, chemical change taking place in milk - boiling, pasteurization, sterilization and homogenization.	**6Hrs**
Unit V	**DIARY CHEMISTRY II** Definition of creams, butter,ghee and ice creams. Milk powder – definition, need for making Powder. Principles involved in drying	**6Hrs**

Text Book:

1.B.K.Sharma, Industrial Chemistry, 13th edition, Goel Publishing House, Reprint 2008.
2.Mp Mathur, Datta Roy D, Dinakar P, "Text book of Diary Chemistry", Indian council of Agricultural Research, New Delhi.

Reference Books:

1.Dilip Kumar Das, Introductory Soil Science, 1st Edition, Kalyani Publishers, Reprint 2002.

Web- Resources:

1. https:// www.chemistryguide.org/
2. http://chemcollective.org/home

Course Outcomes:
On completion of the course the learner will be able

CO 1:	Develop an understanding about type of water.
CO 2:	Experience in water analysis such as TDS, Total hardness, BOD and COD
CO 3:	Expertise in Leather manufacture and processing.
CO 4:	Learn about constituent physical and chemical properties of milk.
CO 5:	Skills in preparation of dairy products such as butter, ghee, ice-cream.

Mapping of Course Outcomes with Programme Outcomes / Programme Specific Outcomes:

CO/PO	PO					**PSO**							
	1	2	3	4	5	1	2	3	4	5	6	7	8
CO1	S	S	S	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S	S	S	S

S - Strongly Correlated

M - Moderately Correlated

W -Weakly Correlated

N – No Correlation

Semester-V / **SKILL BASED ELECTIVE – III**	**POLYMER CHEMISTRY**	Course Code: QUS3
Instruction Hours: 2	Credits: 2	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100

Cognitive Level	**K1-Recalling** **K2-Understanding** **K3-Applying** **K4-Analyzing** **K5-Evaluating** **K6-Creating**	
Course Objectives	• Students learn the chemistry of polymers. • Students learn about Polymer structure, properties and methods of molecular weight determination of polymers. • Students shall know the kinetics of polymers. • Students gain knowledge about the natural and synthetic polymers. • Students learn the constituents and importance of Plastics and Resins.	
UNIT	**CONTENT**	**HOURS**
Unit I	**INTRODUCTION** Introduction to polymers and Macro molecules. Molecular forces and Chemical bonding in polymers. General methods of preparation of polymers.	**6Hrs**
Unit II	**MOLECULAR WEIGHT OF POLYMERS** Polymer structure - Linear, branched and cross linked polymers Stereo chemistry of polymers – Isotactic, sydiotatic and Atactic. Properties of Polymers. Molecular weight of Polymers - Number average molecular weight and weight average molecular weight. Viscosity and molecular weight. Osmometry.	**6Hrs**
Unit III	**UNIT III KINETICS** Co polymerization - Definitions –homo and copolymers, Block copolymers and graft coplymers. Kinetics of polymerization - Kinetics of free radical polymerization kinetics of cationic polymerization. Mean kinetic chain length. Degree of polymerization. Inhibition and retardation. Chain transfer.	**6Hrs**
Unit IV	**NATURAL & SYNTHETIC POLYMER** Natural and synthetic rubbers, constitution of natural rubber. Thiocol, Polyurethane and silicone rubbers. Thermocole polymers related to natural rubber – Chlorinated rubber, oxidized rubber, cyclised rubber and ebonite. Acrylic polymers - Polymers of acrylic acid, methacrylic acid, and poly acrylates.	**6Hrs**
Unit V	**PLASTICS & RESINS** Plastics and Resins - Definitions, Thermoplastic and thermo setting resins. Constituents of plastics fillers, dyes, pigments, plasticizers, lubricants and catalysts. Important thermoplastic resins acrylics, polyvinyl and cellulose derivatives. Important thermosetting resins – Phenolic resins, amino resins, epoxy resins, alkyd resins and silicone resins.	**6Hrs**

Text Book:

1. V.R.Gowarikar, N.V.Viswanathan "Polymer science", Wiley Eastern Ltd., New Delhi, 1978.
2. M.G.Arora, M.Singh and M.S.Yadav " Polymer Chemistry" 2nd Revised edition, Anmol Publications Private Ltd., New Delhi, 1989.

Reference Books:

1. F.W.Bilmeyer, "Text book of Polymer Science", Jr.John Wiley and Sons, 1984.
2. B.K.Sharma " Polymer Chemistry", Goel Publishing House, Meerut, 1989.

e- Resources:

1. https:// www.chemistryguide.org/
2. http://chemcollective.org/home

Course Outcomes:

On completion of the course the learner will be able

CO 1:	To help students explore about polymers and macromolecules.
CO 2:	To assess the molecular weight of polymers, structure and its stereochemistry.
CO 3:	To recognize the kinetics of polymerization.
CO 4:	To distinguish the natural and synthetic polymer.
CO 5:	How to make plastics and resins.

Mapping of Course Outcomes with Programme Outcomes / Programme Specific Outcomes:

CO/PO	PO					**PSO**							
	1	2	3	4	5	1	2	3	4	5	6	7	8
CO1	S	S	S	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S	S	S	S

S - Strongly Correlated

M - Moderately Correlated

W -Weakly Correlated

N – No Correlation

Semester-VI / Core Course-VIII	**ORGANIC CHEMISTRY II**	Course Code:- QUK
Instruction Hours: 6	Credits: 6	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100

Course Objectives:

Cognitive Level	**K1-Recalling** **K2-Understanding** **K3-Applying** **K4-Analyzing** **K5-Evaluating** **K6-Creating**
Course Objectives	• Students learn the Chemistry of Sugars. • Students learn the Chemistry of Amino acids, Nucleic acids and Vitamins. • Students study the Chemistry of Alkaloid and Terpenoid. • Students learn the molecular rearrangement and its mechanism. • Students learn the basic concept of UV-Visible , IR and NMR spectroscopy

UNIT	CONTENT	HOURS
Unit I	**CHEMISTRY OF CARBOHYDRATES** Carbohydrate- classifaication, properties of mono saccharides (glucose and fructose),structure and configuration of mono saccharides, interconversion. Ascending and descending series, muta rotation, epimerization- cyclic structure- determination of size of sugar rings. Disaccharides- sucrose, maltose- structure elucidation- polysaccharide- starch and cellulose(elementary treatment).	**18Hrs**
Unit II	**CHEMISTRY OF PROTEINS AND VITAMINS** Amino acids- Zwitter ion- isoelectric point – general methods of preparation and reactions of amino acids. Peptides- Peptide li;nkages- proteins- classification of proteins. Structure of proteins- primary structure- end group analysis- Edman method- secondary structure- tertiary structure- denaturation- colour reactions of proteins. Nucleic acids- elementary treatment of DNA and RNA. Vitamins-classification, structure and biological importance of vitamins A,B_1,B_2,B_6 ,B_{12} and C.	**18Hrs**
Unit III	**CHEMISTRY OF ALKALOIDS AND TERPENOIDS** Chemistry of natural products- alkaloids- classification, isolation- methods for synthesis of coiine,piperine,nicotine and quinine. Terpenoids- classification- isoprene, special isoprene rule, methods for synthesis of citral, limonene, menthol, camphor.	**18Hrs**
Unit IV	**MOLECULAR REARRANGEMENTS** Molecular rearrangements- types of rearrangement (nucleophilic and electrophilic)- mechanism with evidence for the following re-arrangements: pinacol-pinacolone. Benzil-benzilic acid, Benzidine, Claisen, Fries, Hofmann. Curtius, Lossen, Beckmann and dienone- phenol rearrangements.	**18Hrs**

Unit V	UV - VIS spectroscopy - types of electronic transitions – Instrumentation- solvent effects on λ max - Woodward - Fieser rules for calculation of λ max : dienes only – bathochromic shift and hypsochromicshift. IR spectroscopy - number and types of fundamental vibrations – selection rules- modes of vibrations and their energies. Instrumentation - position of IR absorption frequencies for functional groups like aldehyde, ketone, alcohol, acid, amine andamide. NMRspectroscopy-principle-chemicalshift-factorsaffectingthechemicalshift- inductive effect and hydrogen bonding - TMS, delta scales, splitting of signals - spin-spin coupling, NMR spectrum of EtOH, n -propyl bromide and isopropyl bromide.	**18Hrs**
Unit VI Self Study	Problems based on combined spectroscopic technique	

Text Book:

1.Bahl B.S. and Bahl A., "Advanced Organic Chemistry", 12th edition, Sultan Chand & Co., (2010)
2.Y.R.Sharma, " Elementary Organic Spectroscopy", 5th edition, S.Chand& Company., (2013).

Reference Books:

1. Finar I.L., "Organic Chemistry", Vol 1&2,6th edition,Addison Wesley Longman Ltd. (1996).
2. Morrison R.T. and Boyd R.N., Bhattacharjee S. K. "Organic Chemistry", 7th edition, Pearson (India)., (2011)
3. Pine S.H., "Organic Chemistry",5th edition,McGraw – Hill International Book Company (1987)
4. William Kemp, "Organic Spectroscopy", 3rd edition, ELBS.
5. Silverstein, R. M, Webster, F. M, " Spectroscopy identification of Organic compounds", 7th edition, CRC Press, (2015)

web- Resources:

1.http://organicdivision.org/links.html
2. http://www.chemistryguide.org/
3. http://chemcollective.org/home

Course Outcomes:

On completion of the course the learner will be able

CO 1:	The classification, properties, structure and configuration of mono, di and polysaccharides.
CO 2:	The chemistry of proteins and vitamins.
CO 3:	The importance of alkaloids and terpenoids.
CO 4:	Predicting the molecular rearrangements with its types and mechanism.
CO 5:	The fundamental principles of UV-Vis, IR and NMR spectroscopy.

Mapping of Course Outcomes with Programme Outcomes / Programme Specific Outcomes:

CO/PO	PO					**PSO**							
	1	2	3	4	5	1	2	3	4	5	6	7	8
CO1	S	S	S	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	M	S	S	S	S
CO5	S	S	S	S	S	S	S	S	W	S	S	S	S

S - Strongly Correlated

M - Moderately Correlated

W -Weakly Correlated

N – No Correlation

Semester-VI / Core Course-IX	**PHYSICAL CHEMISTRY II**	Course Code: QUL
Instruction Hours: 6	Credits: 6	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100

Cognitive Level	**K1-Recalling** **K2-Understanding** **K3-Applying** **K4-Analyzing** **K5-Evaluating** **K6-Creating**	
Course Objectives	• Students learn the basics of electrochemistry and they understand the practical use of electricity and their laws. • Students understand the nature of electrolytes and their theories and the concept of emf and its application. • Students learn the concept of electrochemical cell and its applications and the concept of ionic mobility and its practical applications. • Students learn about types and mechanism of catalysis and absorption reactions. • Students understand the effect of radiation on humans and they learn the basics of spectroscopy. • Students learn the use of UV spectroscopy and apply the IR spectroscopy of chemical compounds. • Students learn about concepts of NMR Spectroscopy.	
UNIT	**CONTENT**	**HOURS**
Unit I	**ELECTRICAL CONDUCTANCE** Conductance in metal and in electrolytic solution- specific conductance and equivalent conductance. Arrhenius theory of electrolytic dissociation and its limitation. Weak and strong electrolyte according to Arrhenius theory. Ostwald's dilution law- Derivation, applications and limitation. Effect of dilution on equivalent conductance and specific conductance. Kohlrausch's law and its applications. The elementary treatment of the Debye-Huckel- Onsagar equations for strong electrolytes- evidence for ionic atmosphere. Transport number and Hittorf's rule. Determination of transport number by Hittrof's method and moving boundary method. Application of conductance measurements-determination of degree of dissociation of weak electrolytes-determination of solubility product of a sparingly soluble salt, common ion effect, conductometric titrations.	**18Hrs**
Unit II	**ELECTROCHEMICAL CELLS** Galvanic cells- reversible and irreversible cells. Conventional representation of electrochemical cells. Electromotive force of a cell and its measurement-computation of E.M.F – calculation of thermodynamic quantities of cell reactions (G,H,S and K) Types of reversible electrons-gas/metal ion-metal/metal ion, metal/soluble salt/anion and redox electrodes,electrode reactions. Nernst equation-derivation of cell E.M.F and single electrode potential – standard hydrogen electrode-reference electrodes- standard electrode potentials-sign convention – electrochemical series and its significance. Potentiometric titrations-Acid –Base titrations-Oxidation-reduction(Redox)titrations- Precipitation titrations. Corrosion-general and electrochemical theory- passivity- prevention of corrosion.	**18Hrs**

Unit III	**CATALYSIS AND SURFACE PHENOMENA** Catalyst-Definition and Characteristics-Types of catalysis- Homogeneous and heterogeneous, induced, auto,positive and negative catalysis, catalytic poisons and catalytic promoters. Enzyme catalysis- Michaelis- menten equation and Michaelis – menten law. Adsorption-types-chemical and physical, characteristics of adsorption theory. Different types of isotherms- Freundlich and Langmuir adsorption isotherms.	**18Hrs**
Unit IV	**SPECTROSCOPY I** Electromagnetic spectrum- the region of various types of spectra. Microwave spectroscopy- rotational spectra of diatomic molecules treated as rigid rotator, condition for a molecule to be active in microwave region. Rotational constants (B) and selection rules for rotational transition. Frequency of spectral lines, calculation of inter nuclear distance in diatomic molecules. Infrared spectroscopy- vibrations of diatomic molecules- harmonic oscillators, zero point energy, dissociation energy and force constant, condition for molecule to be active in the IR region, selection rules for vibrational transition, fundamental bands, overtones and hot bands. UV-Visible spectroscopy-conditions- Franck-Condon principle- pre dissociation- applications.	**18Hrs**
Unit V	**SPECTROSCOPY II** Raman spectroscopy- Rayleigh scattering and Raman scattering. Stokes and anti stokes lines in Raman spectra, Raman frequency, quantum theory of Raman effect, conditions for a molecule to be Raman active. Comparison of Raman an IR spectra- structural determination from Raman and IR spectroscopy, rule of mutal exclusion. NMR spectroscopy- nuclear spin and conditions for a molecule to give rise to NMR spectrum- theory of NMR spectra, number of NMR signals, equivalent and non- equivalent protons.	**18Hrs**
Unit VI Self Study	Commerical Cell: Dry cell, Lead Storage,Alkali and H_2-O_2 fuel cells	

Text Book:

1.Puri B.R., Sharma L.R. and Pathania M.S. Principles of Physical Chemistry, (35th edition), New Delhi: Shoban Lal Nagin chand and Co. (2013)
2.Colin Bannwell N and Elaine Mc Cash M, Fundamentals of molecular spectroscopy, 4th edition, Mc Graw hill publishing company limited.

Reference Books:

1. Bahl B.S., Arun Bahl and Tuli G.D. ."Essentials of Physical Chemistry", New Delhi: Sultan Chand and Sons., (2012)
2. Moore W. J. "Physical chemistry", 5th Edition, Orient Longman Ltd., (1972).
3. Glasstone S. and Lewis D., "Elements of Physical Chemistry", London, Mac Millan & Co Ltd.
4. Y.R.Sharma, " Elementary Organic Spectroscopy", 5th edition, S.Chand& Company., (2013).
5. Russell S. Drago,,"Physical methods in Inorganic chemistry", East-west student edition., (1978).

Web- Resources:

1. http://www.chemistryguide.org/
2. http://chemcollective.org/home

Course Outcomes:

On completion of the course the learner will be able

CO 1:	Knowledge of electrical conductance with its applications.
CO 2:	Learn depth about electrochemical cells and electrodes.
CO 3:	The applications of catalysis and isotherms
CO 4:	The use of UV spectroscopy and applications of IR and UV in chemical compounds.
CO 5:	The fundamental application of Raman and NMR spectroscopy.

Mapping of Course Outcomes with Programme Outcomes / Programme Specific Outcomes:

CO/PO	PO					**PSO**							
	1	2	3	4	5	1	2	3	4	5	6	7	8
CO1	S	S	S	S	S	S	S	S	M	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	M	S	S	S	S
CO4	S	S	S	M	S	S	S	S	M	S	S	S	S
CO5	S	S	S	M	S	S	S	S	M	S	S	S	S

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Semester-VI / **CORE PRACTICAL IV**	**GRAVIMETRIC AND ORGANIC ANALYSIS (P)**	Course Code: QUMY
Instruction Hours: 6	Credits: 5	Exam Hours: 3
Internal Marks -40	External Marks-60	Total Marks: 100

Course Objectives:

- Students learn the techniques of gravimetric analysis.
- Students learn the methods of preparing organic compounds.
- Students learn the determination of physical constants of compounds.
- Students learn the techniques of organic qualitative analysis
- Students learn the derivatives of organic qualitative analysis.

GRAVIMETRIC ANALYSIS:

1. Estimation of Lead as lead chromate.
2. Estimation of Barium as barium chromate.
3. Estimation of Nickel as Nickel - DMG complex.
4. Estimation Calcium as calcium oxalate monohydrate
5. Estimation of Barium as barium sulphate.

ONLY FOR DEMONSTRATION:

1. Estimation of Copper as copper (I) thiocyanate
2. Estimation of Magnesium as magnesium oxinate
3. Estimation of Iron as Iron (III) oxide.

ORGANIC QUALITATIVE ANALYSIS AND ORGANIC PREPARATION:

Analysis of Simple Organic compounds

(a) characterization of functional groups

(b) confirmation by preparation of solid derivatives / characteristic color 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.

ORGANIC PREPARATION: (ANY FOUR)

Preparation of Organic Compounds involving the following chemical conversions.

1.Oxidation 2.Reduction 3. Hydrolysis 4. Nitration 5. Bromination 6. Diazotization

7. Osazone formation

DETERMINATION OF PHYSICAL CONSTANTS

Determination of boiling /melting points by semi micro method.

MARK DISTRIBUTION:

Internal : 40		
External : 60	**Gravimetric**	**25**
	Organic Preparation	**10**
	Physical Constant	**05**
	Organic Analysis	**15**
	Record	**05**

Text Book:

1. Venkateswaran V, Veeraswamy R., Kulandaivel A.R.,"Basic Principles of Practical Chemistry", 2nd edition, Sultan chand& sons, (1997)

2. Furniss,B.S., et al., " Vogel's textbook of Practical Organic Chemistry", 7th edition, ELBS, London (1984).

e- Resources:

1. http://www.vlab.co.in/index.php

Course Outcomes:
On completion of the course the learner will be able

CO 1:	To know the technique of organic qualitative analysis.
CO 2:	To learn the determination of Physical constants of organic compounds.

Mapping of Course Outcomes with Programme Outcomes / Programme Specific Outcomes:

CO/PO	PO					**PSO**							
	1	2	3	4	5	1	2	3	4	5	6	7	8
CO1	S	S	S	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S	S	S	S

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Semester-VI / **MAJOR BASED ELECTIVE II**	**NUCLEAR, INDUSTRIAL CHEMISTRY AND METALLIC STATE**	Course Code: QUE4
Instruction Hours: 6	Credits: 5	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100

Cognitive Level	**K1-Recalling** **K2-Understanding** **K3-Applying** **K4-Analyzing** **K5-Evaluating** **K6-Creating**	
Course Objectives	• Students learn about fundamental of Nuclear Chemistry. • Students will learn measurement and applications of radioactive isotopes. • Students study composition and uses of fossil fuels, safety matches, paint and varnish. • Students understand the various theories of metallic bonding, different types of semi conductors. • Students shall know the composition and uses of Inorganic polymers and silicates.	
UNIT	**CONTENT**	**HOURS**
Unit I	**NUCLEAR CHEMISTRY I** Introduction – composition of nucleus and nuclear forces. Nuclear stability – o/p ratio, mass defect, binding energy, packing fraction and magic numbers, shell and drop models. Isotopes – detection and separation. Isotopic constitution of elements and whole number rule. Deviation of atomic weights from whole numbers. Isobars, isotones and isomers.	**18Hrs**
Unit II	**NUCLEAR CHEMISTRY II** Radioactivity- Radioactive emanations. Disintegration theory – modes of decay – Group displacement law – Rate of disintegration – Half life and average life – Radioactive series, Geiger Nuttal rule. Detection and measurements -Wilson cloud chamber & Geiger Muller Counter. Nuclear transformations use of projectiles nuclear reactions fission and fusion. Nuclear reactors. Applications of radio isotopes – Medicine, Agriculture, Industry &Carbon dating – Radio active waste disposal	**18Hrs**
Unit III	**INDUSTRIAL CHEMISTRY** Fossil fuels – varieties of coal and petroleum – petroleum refineries in India. Gaseous fuels – natural, gobar, coal, water, semi water and producer gases. Liquefied Petroleum Gases (LPG) Safety matches – Introduction, Raw materials and manufacturing methods. Paints and varnishes- Definition, types and composition.	**18Hrs**
Unit IV	**METALLIC STATE** Metallic state – packing of atoms in metal (BCC,CCP,HCP). Theories of metallic bonding- Electron gas Pauling and Band theories. Structure of alloys substitutional and interstitial solid solutions – humerothery ratios crystal defects. Semi conductors – Extrinsic and Intrinsic – n-type and p-type conductors. Structure and uses in electronic industry.	**18Hrs**

Unit V	**INORGANIC POLYMERS & SILICATES** Inorganic polymers – coordination polymers, metal alkyls, phosphonitrilic polymers. Silicates – Classification into discrete an ions, one, Two and three dimensional structure with typical examples. composition, properties and uses of beryl, asbestos, talc, mica, zeolites and ultramarines**.**	**18Hrs**

Text Book:

1. R.D. Madan, "Modern Inorganic Chemistry", 2nd edition, S. Chand & Company Ltd., 2000.
2. P.L.Soni, 'Text Book of Inorganic Chemistry', 20th revised edition, Sultan Chand & Sons, 2000.

Reference Books:

1.Gilreath, 'Fundamental concepts of Inorganic Chemistry', 18th Printing, McGraw Hill International Book Company, 1985

2.S. Glasstone, 'Source book on Atomic Energy', East-West Press, 1967.

3. R.Gopalan, P.S. Subramanian and K. Rengarajan, 'Elements of Analytical Chemsitry', Sultan Chand & Sons, 2nd edition, 1991.

4. B. K. Sharma, " Industrial Chemistry", 13th edition, Goel Publishing House, Reprint 2008.

5. F.W.Bilmeyer, "Text book of Polymer Science", Jr.John Wiley and Sons, 1984.

e- Resources:

1. http://www.chemistryguide.org/
2. http://chemcollective.org/home

Course Outcomes:

On completion of the course the learner will be able

CO 1:	Acquire knowledge of nuclear structure, stable and unstable atomic nuclei.
CO 2:	Know the fundamentals of radioactivity, isotopic chemistry, radiation chemistry and the applications of these in medicine, agriculture and industry.
CO 3:	Learn about the fossil fuels, safety matches, paints and varnishes.
CO 4:	Handle the semiconductors.
CO 5:	Gain a preliminary understanding of inorganic polymers.

Mapping of Course Outcomes with Programme Outcomes / Programme Specific Outcomes:

CO/PO	PO					**PSO**							
	1	2	3	4	5	1	2	3	4	5	6	7	8
CO1	S	S	S	S	S	S	S	S	M	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S	S	S	S

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Semester-VI / **MAJOR BASED ELECTIVE III**	**AGRICULTURAL CHEMISTRY**	Course Code:- QUE5
Instruction Hours: 5	Credits: 5	Exam Hours: 3
Internal Marks -25	External Marks-75	Total Marks: 100

Cognitive Level	**K1-Recalling** **K2-Understanding** **K3-Applying** **K4-Analyzing** **K5-Evaluating** **K6-Creating**	
Course Objectives	• Students learn about the composition and properties of soil. • Students understand the source and properties of Micronutrient fertilizer. • Students know the importance of Green manure. • Students study about the pest management and its control. • Students know the chemistry of Fungicide, Herbicide and Acaricide.	
UNIT	**CONTENT**	**HOURS**
Unit I	**COMPOSITION AND PROPERTIES OF SOIL** Definition of soil – soil composition. Soil Physical properties – soil separates and particle size distribution – soil texture and structure. Bulk density, particle density, pore space, soil air, soil temperature, soil water. Soil chemical properties – soil colloids – Inorganic colloids – clay minerals – amorphous – Ion exchange reactions – organic colloids – soil organic matter – Decomposition – Humus formation – significance on soil fertility, soil reaction.	**15Hrs**
Unit II	**MICRONUTRIENT FERTILIZER** Secondary and micronutrient fertilizers – complex and mixed fertilizers – sources, manufacture, properties and reactions in soils. Preparation of slow release fertilizer – compatibility of fertilizers – fertilizer blending – preparation of different fertilizer mixtures. **(15Hrs)**	**15Hrs**
Unit III	**GREEN MANURE** Nutrient potential of different organic manures Agricultural, industrial and urban wastes – preparation of enriched farm yard manures - Zinc enriched organics. Green manures – green leaf manure – bulky organic and concentrated organic manures – compost –composting of coir pith; sugarcane trash, leaf litters and farm wastes – oil cakes, bone meal, fish meal, guano poultry manures - fertilizer use efficiency – integrated nutrient management.**(15Hrs)**	**15Hrs**
Unit IV	**PEST MANAGEMENT & CONTROL** Pesticides – formulations – emulsifiable concentrate, water miscible liquids, wettable powders dusts, granules, classification of pesticides – mode of action – characteristics – uses and safety measures in the analysis and handling of pesticides. Insecticides – plant products – Nicotine, pyrethrum, rotenone, petroleumoils.Inorganic Pesticides – Arsenical fluorides, borates. Organic pesticides – organ chlorine compounds – D.D.T, B.H.C., methoxychlor, chloredane, endosulfon. Organophosphorous compounds dichlorevas, methyl carbamic acid derivatives – carbaryl – structure and mode of action. **(15Hrs)**	**15Hrs**

Unit V	**FUNGICIDES,HERBICIDES& ACARICIDES** Fungicides – inorganic – sulphur compounds – copper compounds – Mercuric compounds, organic – dithiocarbamates – Dithane .Boredeaux mixture. Herbicides : Inorganic herbicides – Arsenical compounds Boron compounds cyanamide – cyanides and thiocyanates, chlorates and sulphamates. Organic herbicides - Nitro-compounds – chlorinated compounds – 2,4D-Pyridine compounds – Triazine compounds – Propionic acid derivatives – urea herbicides, alachlor. Acaricides – Rodenticides – Attractance – Repellants – Fumigants Defoliants. **(15Hrs)**	**15Hrs**

Text Book:

1. N.C. Brady, The nature and properties of soils Eurasia publishing house, (P) Ltd. 9th Ed. 1984.
2. Colling G.H., Commercial Fertilizers McGraw publishing house., 1955

Reference Books:

1.Biswas, T.D. and Mukeherjee S.K. Text book of soil science1987.
2. A.J. Daji A. Text book of soil science Asia publishing house, Madras(1970).
3. Donahue, R.L. Miller, R.W. and shickluna, J.C. soils – An introduction to soils and plant Growth – Prentice Hall of India (P) Ltd., New Delhi1987..
4.Colling G.H. , Commercial Fertilizers McGraw publishing house 1955.
5. Lakshmanan, " Agricultural Chemistry", VVPublishers.,

e- Resources:

1. http://www.chemistryguide.org/
2. http://chemcollective.org/home

Course Outcomes:

On completion of the course the learner will be able

CO 1:	Students acquire the basic knowledge of Composition, Physical and Chemical properties ofsoil.
CO 2:	Students able to understand the secondary and micronutrient fertilizer.
CO 3:	Students can accumulate skills about green manure.
CO 4:	Students should be able to apply the knowledge of Pest Management and control.
CO 5:	Students should know the preparation and applications of fungicides and herbicides.

Mapping of Course Outcomes with Programme Outcomes / Programme Specific Outcomes:

CO/PO	PO					**PSO**							
	1	2	3	4	5	1	2	3	4	5	6	7	8
CO1	S	S	S	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S	S	S	S

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