SRI RAMAKRISHNA MISSION VIDYALAYA
COLLEGE OF ARTS AND SCIENCE
COIMBATORE-641 020

DEPARTMENT OF CHEMISTRY

Mapping of Course Outcomes with Programme Outcomes and Programme Specific Outcomes

B. Sc., Chemistry Programme
(2018 – 2019 onwards)

PROGRAMME OUTCOMES

After completion of the programme, the students will be able to

- ☞ Understand the theoretical and practical aspects of Chemistry.
- ☞ Apply the acquired knowledge for their development.
- ☞ Act and apply Chemistry concepts according to the need of the society.
- ☞ Apply the knowledge for their research pursuits.
- ☞ Apply the skills and knowledge gained through the subject to real life situations and face competitive examinations and interviews with confidence.

PROGRAMME SPECIFIC OUTCOMES

Our Programme will produce quality graduates who

- ☞ will continue their academic development by obtaining higher degrees in chemistry, which will facilitate their professional development.
- ☞ will be capable of getting job opportunities in various chemical industries and academia.
- ☞ will be adaptable, and stand by ethical values in the work place.
- ☞ will possess the capacity to embrace new opportunities, leadership and team work.
- ☞ Will be enriched with lab skills and techniques.

SCHEME OF EXAMINATION

SEMESTER - I									
S. No.	Course code	Part	Course Title	Hrs/ wk	Credits	Exm Hrs	Max. Marks		
							Int	Ext	Tot
1	18UGC1TA1	I	Tamil - I	6	3	3	25	75	100
2	18UGC1EN1	II	English - I	6	3	3	25	75	100
3	18UCH1CO1	III	Core: General Chemistry - I	6	5	3	25	75	100
4	18UCH1AL1	III	Allied: Mathematics - I	6	5	3	25	75	100
5	18UCH2CP1	III	Core: Practical - I	4	--	--	--	--	--
6	18UGC1ENS	IV	Environmental studies	2	2	2	--	75	75
SUB TOTAL				**30**	**18**	--			**475**

SEMESTER – II									
S. No	Course code	Part	Course Title	Hrs/ wk	Credits	Exm Hrs	Max. Marks		
							Int	Ext	Tot
1	18UGC2TA2	I	Tamil - II	6	3	3	25	75	100
2	18UGC2EN2	II	English - II	6	3	3	25	75	100
3	18UCH2C02	III	Core: General Chemistry -II	6	5	3	25	75	100
4	18UCH2AL2	III	Allied: Mathematics – II	6	5	3	25	75	100
5	18UCH2CP1	III	Core: Practical - I	4	4	3	40	60	100
6	18UGC2VAL	IV	Value Education	2	2	2	--	75	75
SUB TOTAL				**30**	**22**	--			**575**

SEMESTER - III									
S.No.	Course code	Part	Course Title	Hrs / wk	Credits	Exam Hrs	Max. Marks		
							Int	Ext	Tot
1	18UGC3TA3	I	Tamil - III	6	3	3	25	75	100
2	18UGC3EN3	II	English - III	6	3	3	25	75	100
3	18UCH3C03	III	Core: General Chemistry –III	6	6	3	25	75	100
4		III	Allied: Physics - I	4	4	3	15	60	75
5	18UCH4CP2	III	Core: Practical - II	4	--	--	--	--	--
6	18UCH4AP1	III	Allied Practical: Physics	2	--	--	--	--	--
7	18UCHNM1	IV	NME-I (Solid State Chemistry) / Basic Tamil-1	2	2	2	--	50	50
SUB TOTAL				**30**	**18**	--			**425**

SEMESTER - IV									
S.No.	Course code	Part	Course Title	Hrs / wk	Credits	Exam Hrs	Max. Marks		
							Int	Ext	Tot
1	18UGC4TA4	I	Tamil - IV	6	3	3	25	75	100
2	18UGC4EN4	II	English - IV	6	3	3	25	75	100
3	18UCH4C04	III	Core: General Chemistry – IV	6	6	3	25	75	100
4	18UCH4AL4	III	Allied: Physics - II	4	4	3	15	60	75
5	18UCH4CP2	III	Core: Practical - II	4	3	6	80	120	200
6	18UCH4AP1	III	Allied Practical: Physics	2	2	3	20	30	50
7	18UCH4NM2	IV	NME-II / Basic Tamil - 2	2	2	2	--	50	50
8	18UGC4EXT	V	Extension Activities-NSS/NCC/Sports	--	01	2	---	50	50
SUB TOTAL				**30**	**24**	--			**725**

SEMESTER - V									
S. No.	**Course Code**	**Part**	**Course Title**	**Hrs/ wk**	**Credits**	**Exm Hrs**	**Max. Marks**		
							Int	**Ext**	**Tot**
1	18UCH5C05	III	Core: Inorganic Chemistry - I	5	5	3	25	75	100
2	18UCH5C06	III	Core: Organic Chemistry - I	5	5	3	25	75	100
3	18UCH5C07	III	Core: Physical Chemistry - I	5	5	3	25	75	100
4	18UCH5EL1	III	Elective: Spectroscopy	4	5	3	25	75	100
5	18UCH5CP4	III	Core Practical: Basic concepts in Chemistry*	-	3	3	-	100	100
6	18UCH6CP4	III	Core Practical: Application Oriented	3	--	--	--	--	--
7	18UCH6CP5	III	Core: Practical -III	6	--	--	--	--	--
8	18UCH6CPR	III	Project Work	2	--	--	--	--	--
SUB TOTAL				**30**	**25**	--			**500**

SEMESTER - VI									
S. No.	**Course Code**	**Part**	**Course Title**	**Hr/ wk**	**Credits**	**Exm Hrs**	**Max. Marks**		
							Int	**Ext**	**Tot**
1	18UCH6C08	III	Core: Inorganic Chemistry-II	5	5	3	25	75	100
2	18UCH6C09	III	Core: Organic Chemistry - II	5	5	3	25	75	100
3	18UCH6C10	III	Core: Physical Chemistry - II	5	5	3	25	75	100
4	18UCH6EL2	III	Elective: Analytical Chemistry	5	5	3	25	75	100
5	18UCH6CP4	III	Core Practical: Application Oriented	3	2	3	40	60	100
6	18UCH6CP5	III	Core: Practical - III	6	6	6	80	120	200
7	18UCH6CPR	III	Project Work	4	5	--	40	60	100
8	18UCH6CP6	III	Fundamentals of Practical Chemistry*	-	2	3	--	100	100
SUB TOTAL				**30**	**33**	--			**900**
GRAND TOTAL					**140**	--	--	--	**3600**

*Online examination

ABSTRACT:

PART	COURSE PARTICULARS	No. of courses	Credits	Max. Marks
I	TAMIL	4	12	400
II	ENGLISH	4	12	400
III	**CHEMISTRY COURSES**			
	Core- Theory	13	63	1400
	Core - Practical	4	13	600
	Project work	1	5	100
	Allied-I Mathematics – Theory	2	10	200
	Allied-II Physics-Theory	2	8	150
	Allied Physics Practical	1	2	50
	NME/Basic Tamil	2	4	100
IV	Environmental Studies	1	2	75
	Value Education	1	2	75
V	Extension Activities- NSS, NCC or Sports	1	1	50
TOTAL			**140**	**3600**

FOR PHYSICS:

SEMESTER – III									
S.No.	**Course code**	**Part**	**COURSE TITLE**	**HRS/WK**	**CREDIT**	**Exam Hours**	**MAX MARKS**		
							INT	**EXT**	**TOT**
01	18UPH3AL3	III	Allied: Chemistry - I	4	4	3	15	60	75
02	18UPH4AP1	III	Allied Practical: Chemistry	2	-	-	-	-	-
03	18UPH3NM1	IV	NME: Solidstate Chemistry	2	2	2		50	50
SEMESTER - IV									
01	18UPH4AL4	III	Allied: Chemistry - II	4	4	3	15	60	75
02	18UPH4AP1	III	Allied Practical: Chemistry	2	2	3	20	30	50
Common NME offering to all II year UG students									
03	18UCH4NM2	IV	NME: Health Awareness and Management	2	2	2	-	50	50

18UCH1C01	CORE: GENERAL CHEMISTRY -I

CO1	Apply wave mechanical concept to know the atomic structure.	K
CO2	Illustrate the aspects of Schrodinger wave equation and shape of orbitals.	U
CO3	Understand the importance of arrangement of elements and periodicity.	U
CO4	Apply the IUPAC rules for naming the organic compounds and to understand the role of electronic effects.	S
CO5	Understand the preparation and properties of alkanes and alkenes, and differences between them.	U

☞ K – Knowledge U – Understanding S - Skill

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	L	S	S	S	M	L	L	M
CO2	M	S	L	M	M	S	M	L	M	M
CO3	S	S	M	M	S	S	M	L	M	M
CO4	S	S	S	S	M	S	S	L	M	S
CO5	S	S	M	S	S	S	S	L	M	S

☞ S – Strong; M – Medium; L – Low

18UCH2C02	CORE: GENERAL CHEMISTRY –II

CO1	Understand the types of bonding and hydrogen bonding in molecules.	U
CO2	Illustrate the preparation, properties of alkynes, alkadienes and alkyls halides, and apply the ideas of aromatic nucleophilic substitution.	K
CO3	Recognise aromatic compounds and understand their electrophilic substitution reactions.	S
CO4	Apply the utility of gas laws and kinetic theory of gases	S
CO5	Analyse the properties of colloids and aspects of solid state.	K

☞ K – Knowledge U – Understanding S - Skill

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	M	S	M	L	M	M
CO2	M	S	M	S	S	S	S	L	M	S
CO3	S	S	M	S	M	S	S	L	L	S
CO4	S	S	S	M	M	S	S	L	M	L
CO5	S	S	S	S	S	S	S	L	M	M

☞ S – Strong; M – Medium; L – Low

18UCH2CP1	CORE: PRACTICAL-I

CO1	To admit the skills on identifying the anions and cations in a mixture.	S
CO2	To convey the skills on diagnosing and eliminating the interfering anions.	S
CO3	To administer competence on the preparation of inorganic complexes.	S

☞ K – Knowledge U – Understanding S - Skill

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	S	S	M	S	S
CO2	S	S	S	S	S	S	S	M	S	S
CO3	S	S	S	S	S	S	S	M	S	S

☞ S – Strong; M – Medium; L – Low

18UCH3C03	CORE: GENERAL CHEMISTRY –III

CO1	Understand the processes involving in metallurgy and importance of s-block elements.	U
CO2	Explain the importance of p-block and d-block elements and their compounds.	K
CO3	Predict the properties of s, p and d block elements.	S
CO4	Understand the preparation of alcohols and their important chemical reactions.	S
CO5	Gain the knowledge on phenol and their synthetic utilities.	K

☞ K – Knowledge U – Understanding S - Skill

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	S	M	S	S	L	M	M
CO2	M	S	M	S	M	S	S	L	M	L
CO3	M	S	M	S	M	S	M	L	L	L
CO4	S	S	M	S	M	S	S	L	M	M
CO5	M	S	M	S	S	S	S	L	M	S

☞ S – Strong; M – Medium; L – Low

18UCH4C04	CORE: GENERAL CHEMISTRY –IV

CO1	Understand the chemistry of lanthanides and actinides.	U
CO2	Gather the knowledge on nuclear chemistry and its applications.	K
CO3	Apply the fundamental concepts of thermodynamics to chemical reactions.	S
CO4	Acquire knowledge on second law of thermodynamics and apply day today life.	K
CO5	Understand the fundamentals of chemical equilibrium and its applications.	U

☞ K – Knowledge U – Understanding S - Skill

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	S	M	S	S	L	M	M
CO2	S	S	S	S	S	S	S	L	M	M
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	L	S	S
CO5	M	S	S	S	S	S	S	L	S	M

☞ S – Strong; M – Medium; L – Low

18UCH4CP2	CORE: PRACTICAL –II

CO1	Enhance their skills in volumetric analysis.	S
CO2	Perform organic qualitative analysis.	S
CO3	Prepare and produce fine crystals of organic compounds.	S

☞ K – Knowledge U – Understanding S - Skill

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	M	S	S	M	S	S
CO2	S	S	S	S	M	S	S	M	S	S
CO3	S	S	S	S	M	S	S	M	S	S

☞ S – Strong; M – Medium; L – Low

18UCH5C05	CORE: INORGANIC CHEMISTRY –I

CO1	Understand the elementary concepts of coordination chemistry and identify the various types of isomerisms.	U
CO2	Become versed in bonding, magnetic behaviours, and color via VB and CF theories.	K
CO3	Recognize the nomenclature of coordination compounds, understand the concept of coordination theories, and learn the industrial and biological applications of coordination complexes.	S
CO4	Apprehend the applications of coordination compounds.	K
CO5	Conceive the basic structural dimensions of crystal systems.	U

☞ K – Knowledge U – Understanding S - Skill

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	S	M	S	S	L	M	M
CO2	S	S	S	S	S	S	S	L	S	S
CO3	S	S	S	S	S	S	S	L	M	S
CO4	S	S	S	S	S	S	S	L	M	M
CO5	M	S	M	S	M	S	S	L	M	M

☞ S – Strong; M – Medium; L – Low

18UCH5C06	CORE: ORGANIC CHEMISTRY –I

CO1	Know the physical and chemical properties of sulphonic acids and phenols.	U
CO2	Learn the preparation and properties of mono and di carboxylic acids.	U
CO3	Learn the preparation and properties of amines.	U
CO4	Learn the synthesis and chemical reaction of nitrogen heterocycles.	K
CO5	Have a firm understanding on molecular rearrangements.	U

☞ K – Knowledge U – Understanding S - Skill

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	M	S	S	L	M	L
CO2	M	S	S	S	S	S	S	L	M	M
CO3	S	S	S	S	S	S	S	L	M	M
CO4	S	S	S	S	S	S	S	L	M	M
CO5	M	S	M	S	M	S	S	L	M	S

☞ S – Strong; M – Medium; L – Low

18UCH5C07	CORE: PHYSICAL CHEMISTRY –I

CO1	Know about the basic concepts of electrolysis	K
CO2	Understand the applications of conductance measurements	U
CO3	Solve problems in ionic equilibria	S
CO4	Measure EMF and apply for recent problems	S
CO5	Develop some commercial cells	S

☞ K – Knowledge U – Understanding S - Skill

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	S	S	L	S	S
CO2	S	S	S	S	S	S	S	L	M	S
CO3	M	S	M	S	M	S	S	L	M	S
CO4	S	S	S	S	M	S	S	L	S	S
CO5	S	S	S	S	S	S	S	L	S	S

☞ S – Strong; M – Medium; L – Low

18UCH5EL1	ELECTIVE: SPECTROSCOPY

CO1	Know the fundamental concepts of electromagnetic spectrum.	U
CO2	Analyse the compounds through IR spectroscopy.	S
CO3	Characterise the compounds using electronic spectroscopy.	S
CO4	Have knowledge on NMR spectroscopy.	K
CO5	Recognise the significance of Mass spectrometry.	U

☞ K – Knowledge U – Understanding S - Skill

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	S	S	S	L	M	S
CO2	S	S	M	S	S	S	S	L	M	S
CO3	S	S	M	S	S	S	S	L	M	S
CO4	M	S	M	S	M	S	S	L	M	S
CO5	S	S	S	S	M	S	S	L	M	S

☞ S – Strong; M – Medium; L – Low

18UCH5CP3	Self-Study Course: BASIC CONCEPTS OF CHEMISTRY

CO1	Revise and strengthen the concepts of basic chemistry.	K

☞ K – Knowledge U – Understanding S - Skill

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	M	S	S	L	M	S

☞ S – Strong; M – Medium; L – Low

18UCH6CO8	CORE: INORGANIC CHEMISTRY - II

CO1	Calculate the oxidation number and balance the redox equations.	S
CO2	Learn the chemistry of Manganese, Cobalt, and Nickel.	U
CO3	Understand the structure, properties, and uses of boron and its compounds.	U
CO4	Understand the characteristics of non-aqueous solvents.	U
CO5	Recognize the various types of acids and bases, and effects of substituents.	K

☞ K – Knowledge U – Understanding S - Skill

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	S	M	S	S	L	M	L
CO2	M	S	S	S	S	S	S	L	M	L
CO3	S	S	M	S	S	S	S	L	M	S
CO4	S	S	S	S	M	S	S	L	M	M
CO5	S	S	S	S	S	S	S	L	M	M

☞ S – Strong; M – Medium; L – Low

18UCH6CO9	CORE: ORGANIC CHEMISTRY - II

CO1	Identity various structural and stereo isomers and their notations.	S
CO2	Distinguish various conformations of cyclohexanes.	K
CO3	Understand the chemistry of free radicals.	U
CO4	Understand various addition reactions of alkenes	U
CO5	Classify and understand the properties of carbohydrates, peptides and proteins.	U

☞ K – Knowledge U – Understanding S - Skill

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	S	M	S	S	L	M	M
CO2S	S	S	M	S	M	S	S	L	M	S
CO3	S	S	M	S	M	S	S	L	M	S
CO4	S	S	M	S	M	S	S	L	M	M
CO5	S	S	S	S	M	S	S	L	M	M

☞ S – Strong; M – Medium; L – Low

18UCH6C10	CORE: PHYSICAL CHEMISTRY - II

CO1	Know the applications of phase rule.	K
CO2	Understand the kinetics of various chemical reactions.	U
CO3	Realize the applications of catalysts and the mechanism of catalytic action.	K
CO4	Recognize the significance of surface chemistry in day-to-day activities.	S
CO5	Perceive the knowledge on photochemistry.	U

☞ K – Knowledge U – Understanding S - Skill

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	S	M	S	S	L	M	M
CO2	S	S	M	S	S	S	S	L	M	M
CO3	S	S	M	S	S	S	S	L	M	M
CO4	S	S	M	S	M	S	S	L	M	M
CO5	S	S	M	S	S	S	S	L	M	M

☞ S – Strong; M – Medium; L – Low

18UCH6EL2	ELECTIVE: ANALYTICAL CHEMISTRY - I

CO1	Know how to store and handle the adverse chemicals.	K
CO2	Analyze and validate the methods and data.	K
CO3	Identification and classification of common inorganic cations and anions.	S
CO4	Quantitative estimation of chemicals through various titrations.	S
CO5	Estimate the metal ions gravimetrically.	S

☞ K – Knowledge U – Understanding S - Skill

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	S	S	M	S	S
CO2	S	S	S	S	S	S	S	M	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	S	S	S	S	S	S	M	S	S

☞ S – Strong; M – Medium; L – Low

18UCH6CP4	CORE PRACTICAL: APPLICATION ORIENTED PRACTICAL

CO1	Estimate the common textile industry chemicals like hydrogen peroxide and chlorine.	S
CO2	Able to estimate the essential parameters in water analysis like pH, TDS, and hardness.	S
CO3	Calculate the saponification and iodine value of oils.	S

☞ K – Knowledge U – Understanding S - Skill

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	L	S	S

☞ S – Strong; M – Medium; L – Low

18UCH6CP5	CORE : PRACTICAL - III

CO1	Estimate the common metal ions gravimetrically.	S
CO2	Assimilate the fundamental physical chemistry concepts through experiments.	S

☞ K – Knowledge U – Understanding S - Skill

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S

☞ S – Strong; M – Medium; L – Low

18UCH6CP6	Self-Study Course: FUNDAMENTALS OF PRACTICAL CHEMISTRY

CO1	Take competitive examinations easily	S
CO2	Have problem solving competency	S

☞ K – Knowledge U – Understanding S - Skill

	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S

☞ S – Strong; M – Medium; L – Low

Programme: B.Sc., Chemistry Course code: **18UCH1C01**

Course Title: **Core: General Chemistry – I**

PART-III Year: I Semester: I Credits: 5 Total Hours: 6 x 15 = 90

UNIT- I

Rutherford's nuclear model of atom- Experiment, postulates and objections. Black body Radiation, Planck's quantum theory of radiation, Photoelectric effect with Einstein's explanation and Compton effect. Bohr's model of the atom-postulates, calculation of radius of Bohr's orbits, velocity of electron and energy of electron, significance of negative value of energy of electron. Bohr's Explanation of hydrogen spectrum, Sommerfiled's extension of Bohr's theory and shortcomings of Bohr's Theory.

UNIT-II

Wave mechanical model - derivation of de Broglie's equation, verification by Davisson and Germer experiment. Schrodinger wave equation- derivation, application to hydrogen atom, physical significance of $\nabla^2\Psi$ and Ψ^2. Charge cloud concept and shapes of s, p, d and f orbitals. Origin, description and salient features of quantum numbers (n, l and m). Zeeman effect and spin quantum number. Pauli's exclusion principle and Hund's rule, aufbau principle, (n + l) rule, stability of half filled and completely filled orbitals.

UNIT- III

Description of the latest IUPAC periodic table, periodicity and periodic properties- Atomic radii- covalent radii, multiple bond radii, hybridisation and atomic radius, variation of atomic radius along period and group, ionic radii- size of cation and anion, comparison with neutral atom, isoelectronic ions, variation of ionic radius along a group and a period. Ionisation energy -first and successive, factors governing, variation along groups and II period. Electron affinity-factors governing, variation along periods and halogen group. Electronegativity – variation along a period and group, Mulliken -Jaffee concept- oxidation state, hybridisation, charge and bond order.

UNIT- IV

Classification of organic compounds, functional group, homologous series. Systems of naming organic compounds- trivial, derived and IUPAC. Rules of IUPAC system of nomenclature of acyclic compounds, IUPAC system of nomenclature of complex organic compounds- aliphatic hydrocarbons, with mono and poly functional groups.

Polar, non-polar molecules, electron donating and withdrawing groups. Polar effects-inductive, mesomeric, electromeric and hyperconjugation. Homolytic and heterolytic fission- free radicals, carbocations, carbanions and their structures and stabilities. Electrophiles and nucleophiles.

UNIT-V

Alkanes- preparation of alkanes by direct reduction of alkyl halides, Sabatier- Senderens reaction, Wurtz reaction, decarboxylation and Kolbes electrolysis. Relationship between structure and physical properties. Chemical properties of alkanes-isomerisation, aromatization, pyrolysis, combustion, controlled oxidation, nitration, sulphonation, halogenation with relative reactivities of halogens.

Alkenes-general methods of preparation of alkenes- dehydrohalogenation, dehydration of alcohols, dehalogenation of vicinal dihalides, controlled reduction of alkynes, Electrophilic addition of alkenes- hydrogenation, halogenation, hydrohalogenation, (Markovnikov's rule and Kharasch effect with HBr), halohydrin

formation, hydration, hydroboration, Oxidative cleavage reactions- ozonolysis and hydroxylation, Substitution reaction of propene at low and high temperature. Tests for alkenes.

Text Books:

1. M. K. Jain and S. C. Sharma, Modern Organic Chemistry, Vishal Publications, (2017)
2. R. L. Madan, Chemistry of Degree students, S. Chand & Company, (2014).
3. ArunBahl, B. S. Bahl and G.D.Tuli, Essentials of Physical Chemistry, S. Chand & Company, (2008).

Reference Books:

4. R. D. Madan, Modern Inorganic Chemistry, S. Chand & Company, (2013).
5. B. R. Puri, L. R. Sharma and Madan S. Pathania, Principles of Physical Chemistry, Vishal Publications, (2010)

Programme: B.Sc., Chemistry Course code: **18UCH2C02**

Course Title: **Core: General Chemistry – II**

PART-III Year: I Semester: II Credits: 5 Total Hours: 6 x 15 = 90

UNIT-I

Chemical bonding- Ionic bonding- factors influencing the formation of ionic bond-characteristics of ionic compounds-Born-Haber cycle. Covalent bond - factors influencing the formation covalent bond-partial ionic character in covalent bond and calculation of percentage ionic character-Fajan's rule and coordinate bond-basics and examples, BF_3-NH_3, Metal-Ligand and $AlCl_3$. Concept of resonance-resonance energy- resonance structures of O_3, CO, N_2O, CO_3^{2-} and SCN^-. Molecular Orbital theory (MOT) postulates. Molecular Orbital diagram for H_2, He_2, He_2^+, N_2, O_2 and NO with their bond order and magnetic character. Valence Shell Electron Pair Repulsion (VSEPR) theory- geometry of BeF_2, BF_3, CH_4, NH_3, H_2O, PCl_5,SF_6, CO_2 and SO_2.

Hydrogen bonding- conditions, types, reasons for solubility of NH_3 and alcohols, abnormal boiling point of water and low density of ice, significance of hydrogen bonding in the structure of DNA, the physical state of water and H_2S.

UNIT- II

Alkadienes- classification, conjugated dienes-preparation from diol, alkyne, dihalide and alkane. Chemical properties-1, 2 and 1,4 electrophilic addition, homo and intramolecular cyclisation, Diels-Alder reaction. Stability of conjugated dienes, Preparation of poly butadiene , Buna-N and Buna-S rubbers.

Alkynes- preparation from gem and vicinal dihalides, tetrahalides, lower alkynes. Chemical properties- acidity of alkynes, catalytic and chemical reductions, hydrohalogenation, hydration, hydroboration, oxidation with neutral $KMnO_4$, ozonolysis and polymerization (dimer, trimer and tetramer), Tests for alkynes.

Alkyl halides-preparation from alkanes,alkenes, alkynes, alcohols and by halide exchange and Hunsdiecker reaction. Chemical properties- reaction with aqueous alkali, alcoholic alkali (Saytzeff and Hoffmann orientation).Aliphatic nucleophilic substitution-S_N1, S_N2 and SN^i mechanisms, Relative reactivities ofalkyl halides towards S_N1 and S_N2 mechanisms.`

UNIT-III

Cycloalkanes-synthesis by internal Wurtz reaction, Freund's method, decarboxylation and Dieckmann's condensation, Chemical properties - substitution and ring opening reactions of cyclopropane and cyclobutane. Baeyer's strain theory, Sache-Mohr theory.

Aromaticity - Huckle's rule and its applications to benzene, naphthalene, antharacene, phenantharene, [10]annulene, [12]annulene pyridine, pyrrole, cyclopropenyl cation, tropylium cation and cyclopentadienyl anion.

Mechanism of aromatic electrophilic substitution reactions of benzene and toluene-halogenation, nitration and sulphonation.Friedel-Crafts alkylation and acylation of benzene.

UNIT-IV

Gas Laws - Boyle's, Charles's, Gay Lusac's, Avgadro's, Dalton's and Graham's. Postulates of kinetic theory of gases-derivation of kinetic gas equation-derivation of gas laws,and ideal

gas equation. Maxwell's distribution of molecular velocities (derivation not necessary). Root mean square velocity, average velocity and most probable velocity, Mean free path, Collision diameter and collision frequency.

UNIT-V

Colloids- classification, preparation and purification. Origin of charge of colloidal particles, stability of colloids. Properties of Colloids- Tyndall effect, Brownian movement, Helmoltz electrical double layer, elctrophoresis, eletroosmosis, coagulation, protective action of sols (gold number). Applications- blue colour of the sky, clarification of water, formation of delta, electrical precipitation of smoke.

Solid state-crystalline and amorphous solids-differences between them-definitions of space lattice, Unit cell, Crystal systems, Bravais lattices. Weiss and Miller indices, Number of atoms in simple, face centred and body centred cubic cells, Structure of CsCl and NaCl. Liquid crystals-types, properties and applications.

Text Books:

1. M. K. Jain and S. C. Sharma, Modern Organic Chemistry, Vishal Publications (2017)
2. R. L. Madan, Chemistry of Degree students, S. Chand & Company (2014).
3. ArunBahl, B.S.Bahl and G.D.Tuli, Essentials of Physical Chemistry, S. Chand & Company (2008).

Reference Books:

4. R. D. Madan, Modern Inorganic Chemistry, S. Chand & Company, (2013).
5. B. R. Puri, L. R. Sharma and Madan S. Pathania, Principles of Physical Chemistry, Vishal Publications, (2010).

Programme: B.Sc., Chemistry Course code: **18UCH2CP1**

Course Title: **Core: Practical - I**

PART-III Year: I Semester: I &II Credits: 4 Total Hours: 4 x30 = 120

A.Qualitative Inorganic analysis

1. Semi micro method of analysis of a mixture containing two cations and two anions of which one may be an interfering acid radical requiring elimination during the analysis of basic radical.

2. Radicals for the reactions

a. Basic radicals:- Lead , copper, zinc, bismuth, cadmium, tin, iron, aluminium, Manganese, magnesium, cobalt, nickel, calcium, barium, strontium, ammonium

b. Acidic radicals:- Sulphate, carbonate, nitrate, chloride, bromide, iodide, oxalate, arsenite, arsenate, phosphate, borate and chromate

B. PREPARATION OF INORGANIC COMPLEXES

Preparation of any four of the following complexes:

Prussian Blue, Tetramminecopper(II)sulphate tetrahydate, Tris(thiourea)copper(II)sulphate dehydrate, Potsassiumtrioxalatochromate(III), Potsassiumtrioxalato ferrate(III), Hexamminecobalt(III)chloride and Ammonium hexachlorostannate(III)

Text Book:

V. Venkateswaran, R. Veeraswamy and A. R. Kulandaivelu, Basic Principles of Practical Chemistry, Sultan Chand &sons (2006)

Programme: B.Sc. Chemistry | Course Code: **18UCH3C03**

Part: III | Course Title: **Core**:**General Chemistry - III**

Year: II | Semester: III | Credits: 5 | Total Hours:6 x 15 = 90

Unit I

Metallurgy: Concentration of ores- Gravity separation, Froth floatation, Magnetic separation, Chemical separation, Calcination and Roasting. Reduction of free metal-smelting, using CO, Alumino-thermic, Electrolytic reduction, Purification - electrorefining, zone refining, thermal decomposition-Mond's and Van Arkel processes. Ellingham diagram for oxidation of metals to metal oxides.

***s*-Block elements:** Properties- factors affecting lattice energy of ionic solids, factors affecting andvariation of hydration energy of ions in periodic table. Diagonal relationship (Li & Mg, Be & Al) in the periodic table. Extraction of Lithium. Complexes of alkali metals-the wrap around complexes and their biological importance.

Unit II

***p*-Block elements:** Variation of properties -valency, atomic radius, ionisation energy, electron affinity, electronegativity, metallic character, oxidising and reducing properties, diagonal relationship between boron & silicon and inert pair effect. Oxides - Classification based on chemical behaviour and oxygen content. Hydrogen peroxide - preparation, properties, structure and uses (including volume calculation). Oxy acids of Sulphur - Preparation, properties and uses of sulphuric acid, Caro's acid, Marshall's acid and oleum.

Unit III

***d*-block elements**: Electronic configuration, general characteristics - metallic character, atomic volume and atomic radii, ionisation potential, oxidation states, formation of coloured compounds, magnetic properties, formation of complexes and catalytic properties. Extraction of Vanadium and Tungsten. Chemistry of titanium dioxide, titanium tetra chloride, vanadium pentoxide, ammonium molybtate, molybdenum blue, tungsten carbide, tungstic acid and tungsten bronzes.

Unit IV

Alcohols: General classification, monohydric alcohols - classification, nomenclature - common, IUPAC and carbinol. Preparation of alcohols with mechanisms - hydrolysis of alkyl halides, hydration of alkenes into primary, secondary and tertiary alcohols, hydroboration, oxymercuration/demercuration of alkenes, reduction of aldehydes, ketones &esters, and hydrolysis of esters. Manufacture of ethyl alcohol from molasses and starch,

rectified spirit absolute alcohol and denatured alcohol. Physical properties - boiling points and solubility with reference to hydrogen bonding and hydrophobic nature. Chemical properties - acidic nature, reaction with- carboxylic acids, acid halides and anhydrides, hydrogen halides and phosphorous halides.Iodoform test, oxidation, dehydrogenation and dehydration. Distinction among primary, secondary and tertiary alcohols. Interconversion of alcohols-Lower primary to higher primary, primary to secondary, secondary to tertiary alcohols. Breath analysis test.

Unit V

Phenols:Classification and nomenclature, Preparation- from sulphonic acids, diazonium salts, aryl halides, sodium tests of carboxylic acids and cumene.Physical properties and chemical properties- Acidic character, effect of substituents on the acidity of phenol, reaction with neutral ferric chloride, sodium, zinc dust and ammonia. Oxidation, esterification and Williamson's synthesis.Electrophilic substitution-halogenation,nitration,sulphonation,Friedel-Craft's alkylation and acylation,phthalein fusion, mechanisms of reactions - coupling, Reimer-Tiemann, Kolbe-Schmidt, Liebermann and Gattermann. Dihydric phenols-Dakin's reaction, Houben -Hoeschreactionand Fluorescein formation. Tests for phenols.

Text Books**:**

1. M. K. Jain and S.C. Sharma, Modern Organic Chemistry, Vishal Publications (2017).
2. R.L. Madan, Chemistry for Degree Students, S. Chand & Company (2014).
3. R.D.Madan, Modern Inorganic Chemistry, S.Chand& company (2013).

Reference Books**:**

1. B. R. Puri, L.R. Sharma and Kalia, Principles of Inorganic Chemistry, Milestone Publishers & Distributors, (2011).
2. ArunBahl and B.S. Bahl, Advanced Organic Chemistry, S. Chand & Company, (2016).
3. R.T.Morrison and R.N. Boyd, Organic Chemistry, 7th edition, Pearson publishers. (2009)
4. J. D. Lee, Concise Inorganic Chemistry, 5thedition, Oxford University Press (2008).
5. I.L. Finar, Organic Chemistry, Vol. I, Pearson Education India. (2002).
6. Paula Y. Bruice, Organic Chemistry, 8th edition, Pearson Education (2017).

Programme: B.Sc. Chemistry | Course Code: **18UCH4C04**

Part: III | Course Title: **Core: General Chemistry - IV**

Year: II | Semester: IV | Credits: 5 | Total Hours: 6 x 15 = 90

Unit I:

***f*-Block elements:** Position in the periodic table, lanthanides - electronic configuration, oxidation states, lanthanide contraction - cause and consequences, complex formation, occurrence and extraction from monazite, separation of monazite by ion exchange method. Compounds of lanthanum - oxides and halides, uses of lanthanides. Actinides: general features of actinides - electronic configuration, oxidation states, ionic radius, actinide contraction, colour of ions and formation of complexes. Separation of Np, Pu and Am from uranium, trans uranic elements. Similarities and differences between lanthanide and actinides.

Unit II:

Nuclear Chemistry: Composition of nucleus, properties of α, β and γ rays, nuclear forces (meson theory) - nuclear stability- mass defect, binding energy, packing fraction, n/p ratio and magic numbers. Isotopes, isobars, isotones, isomers, and mirror nuclei (basic idea only). Detection of isotopes by Aston's mass spectrograph method. Radioactive disintegration- modes of decay, rate of disintegration, half-life period, average life and radioactive disintegration series. Nuclear fission- atom bomb, nuclear power generator, nuclear fusion - hydrogen bomb and stellar energy, uses of radioactive isotopes- in medicine, analytical chemistry and carbon dating.

Unit III:

Thermodynamics: Systems, Surroundings, Boundary, Intensive and Extensive properties. Concept of heat and work. State and Path functions, Thermodynamic processes.

First law of thermodynamics: Statement, definition of internal energy and enthalpy. Heat capacity - at constant volume and pressure and their relationship. Joule's law, Joule-Thomson coefficient and inversion temperature. Calculation of w, q, dU and dH for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process.

Thermochemistry: Standard state, standard enthalpy of formation. Hess's law of heat summation and its applications. Heat of reaction at constant pressure and volume. Enthalpy of combustion, Enthalpy of neutralisation. Bond dissociation energy and its calculation from thermo-chemical data, temperature dependence of enthalpy. Kirchhoff's equation.

Unit IV:

Second law of thermodynamics: Need for the law, different statements, Carnot cycle and its efficiency, Carnot theorem. Thermodynamic scale of temperature.

Concept of entropy: entropy as a state function, entropy as a function of V & T and P & T, entropy change in physical change, Clausius inequality, entropy as criteria of spontaneity and equilibrium. Entropy change in ideal gases and mixing of gases, entropy change in

natural processes. Gibbs function (G) and Helmholtz function (A) as thermodynamic quantities, "A" and "G" as criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change. Variation of G, and A, with P, V, and T.

Third law of thermodynamics: Nernst heat theorem, statement and concept of residual entropy, evaluation of absolute entropy from heat capacity data.

Unit V:

Chemical equilibrium: Reversible reactions, nature and characteristics of chemical equilibrium, law of mass action, equilibrium constant in terms of concentration and partial pressure. Thermodynamic derivation of law of chemical equilibrium, van't Hoff equation, van't Hoff equation in terms of Le Chatelier's principle - the effects of change of concentration, pressure and temperature and Haber's process.

Thermodynamic derivation of colligative properties: Molal depression of freezing point, Elevation of boiling point, the usefulness in determining molar masses. Osmosis - principle, Measurement of osmotic pressure, Calculation of molecular weight and applications of reverse osmosis.

Text Books:

1. R. L. Madan, Chemistry for Degree Students, S. Chand & Company (2014).
2. R. D. Madan, Modern Inorganic Chemistry, S. Chand & company (2013).
3. ArunBahl, B. S Bahl and G. D Tuli, Essentials of Physical Chemistry, S. Chand & company, (2008).

Reference Books:

1. B. R. Puri, L.R. Sharma and Kalia, Principles of Inorganic Chemistry, Milestone Publishers & Distributors, (2011).
2. B. R. Puri, L.R. Sharma and Pathania, Principles of Physical Chemistry, Vishal publishing company, (2017).
3. H. J. Arnikar, Essentials of Nuclear Chemistry, New Age International, (1995).
4. J. D. Lee, Concise Inorganic Chemistry, 5th Edition, Wiley Publications (2008).
5. Peter Atkins, Julio de Paulo, Atkin's Physical Chemistry, 11th Edition, Oxford University Press, Oxford, UK, (2017).

Programme: B.Sc., Chemistry Course code: **18UCH4CP2**

Course Title: **Core:Practical - II**

PART-III Year: II Semester: III & IV Credits: 5 Total Hours: 4 x30 = 120

A. VOLUMETRIC ANALYSIS

Acidimetry and Alkalimetry

1. Estimation of sodium carbonate using link hydrochloric acid and standard sodium carbonate.
2. Estimation of hydrochloric acid using link sodium hydroxide and standard oxalic acid.
3. Estimation of carbonate and bicarbonate in a mixture by Warder's method.

Permanganometry

4. Estimation of ferrous iron using link potassium permanganate and standard oxalic acid.
5. Estimation of oxalic acid using link potassium permanganate and standard ferrous ammonium sulphate.
6. Estimation of calcium using link potassium permanganate and standard oxalic acid.

Dichrometry

7. Estimation of ferric iron using standard potassium dichromate and external indicator potassium ferricyanide.
8. Estimation of ferric iron using standard potassium dichromate and internal indicator diphenylamine
9. Estimation of potassium dichromate using link sodium thiosulphate and standard potassium dichromate.

Iodometry and iodimetry

10. Estimation of copper using link sodium thiosulphate and standard potassium dichromate.
11. Estimation of arseneous oxide using link iodine and standard arseneous oxide.

Argentometry(demonstration)

12. Estimation of chloride using link silver nitrate and standard sodium chloride.
13. Estimation of hardness of water by EDTA method.

B.ORGANIC CHEMISTRY PRACTICALS

Qualitative analysis of monofunctional groups

Organic compounds containing any one of the following functional groups/compounds may be given for analysis:

Acids, esters, aldehydes, ketones, nitro compounds, anilides, amines, carbohydrates, amides, phenols, naphthols, dihydric phenols, aromatic nuclear halogen compounds and aromatic side chain halogen compounds, urea and thiourea.

C.ORGANIC PREPARATIONS

Preparation of acetanilide from aniline, benzanilide from aniline, benzoic acid from ethylbenzoate, parabromoacetanilide from acetanilide, aspirin, nitrobenzene, glucosazone and salicylic acid from methyl salicylate.

REFERENCE BOOKS

1. V. Venkateswaran, R. Veeraswamy and A. R. Kulandaivelu, Basic Principles of Practical Chemistry, Sultan Chand &sons (2006)
2. 2. A. Thomas, Practical Chemistry Scientific Book Centre, Cannanore.

Programme: B.Sc., Chemistry Course code: **18UCH5C05**

Course Title: **Core - Inorganic Chemistry - I**

PART-III Year: III Semester: V Credits: 5 Total Hours: 5 x15 = 75

UNIT- I

Coordination chemistry - terminology, classification of ligands, chelation, nomenclature of complexes, Werner's theory and Effective Atomic Number (EAN) concept. Isomerism in complexes-structural isomerism-coordination, ionisation, hydrate, ligand and linkage isomerism. Stereoisomerism-geometrical isomerism in 4 coordinated complexes – Ma_2b_2, Ma_2bc, $M(ab)_2$ and 6 coordinated complexes - Ma_4b_2, Ma_3b_3, $M(aa)_2b_2$. Optical isomerism and conditions for optical isomerism- optical isomerism in 6 coordinated complexes - $M(aa)_3$ and $M(aa)_2b_2$.

UNIT – II

Theories of metal - ligand bonding in complexes - valence bond theory (VBT), formation of outer orbital and inner orbital complexes, magnetic behaviour of the complexes and limitations of VBT. Crystal field theory (CFT) - crystal field splitting in octahedral and tetrahedral complexes. Strong and weak ligands, factors affecting Δ_o values, spectrochemical series, high spin and low spin complexes. Application of CFT to magnetic properties and colour of complexes, crystal field stabilisation energy (CFSE) and its uses. Limitations of CFT. Comparison between VBT and CFT.

UNIT – III

Applications of coordination compounds in quantitative analysis - gravimetric estimation of nickel using DMG and aluminum using oxine, estimation of hardness of water using EDTA. Structures and functions of chlorophyll and hemoglobin. Metal carbonyls-general methods of preparation, nature of M-CO bond, structure of $Ni(CO)_4$, $Fe(CO)_5$, $Fe_2(CO)_9$, $Mn_2(CO)_{10}$ and $Co_2(CO)_8$.

UNIT – IV

Calculation of number of atoms in simple cubic (SC), face centered cubic (FCC) and body centred cubic (BCC) unit cells. Symmetry in crystals - symmetry operations and symmetry elements - plane of symmetry, axis of symmetry and centre of symmetry. Symmetry elements of a cubic crystal. Semiconductors - intrinsic and extrinsic - n-type and p-type. Electron gas theory and band theory of metals.

UNIT – V

Alloys - simple mixtures, solid solutions, substitutional and interstitial alloys. Hume - Rothery ratios and their applications. Structure of the ionic crystals - AX type - NaCl, CsCl and ZnS -(zinc blende and wurtzite structures), AX_2 type - CaF_2 and TiO_2. Limiting radius ratio rule- coordination number and shape of the ionic crystals. Defects in crystal structures: stoichiometric defects - Schottky and Frenkel defects. Non - stoichiometric defects-metal excess and metal deficiency defects.

Textbooks

1. B. R. Puriand L. R. Sharma, Principles of Inorganic Chemistry, Milestone Publication.
2. R. D. Madan, Modern Inorganic Chemistry, S. Chand & Company.
3. W. U. Malik, G. D. Tuli and R. D. Madan, Selected Topics in Inorganic Chemistry, S. Chand & company

Programme: B.Sc., Chemistry Course code: **18UCH5C06**

Course Title: **Core: Organic Chemistry -I**

PART-III Year: III Semester: V Credits: 5 Total Hours: 5 x15 = 75

UNIT I

Preparation and properties of benzene suphonic acid and suphanilic acid. Phenol - preparation, resonance structures, bromination, nitration, oxidation, reduction, Schotten-Baumann, phthalein fusion and coupling reactions. Mechanisms of Reimer-Tiemann and Kolbe-Schmidt reactions. Tests for phenol. Preparation and properties of o-cresol, catechol, resorcinol and pyrogallol.

UNIT II

Preparation and properties of formic and acetic, benzoic, oxalic and malonic acids. Action of heat on formic, acetic, oxalic, malonic and succinic acids – Blancks rule - Mechanism of hydrolysis of esters by $B_{AC}2$ and $A_{AC}2$. Diethyl malonate - preparation and synthesis of acetic acid, adipic acid, cinnamic acid, glycine and malonyl urea from diethyl malonate. Ethylacetoacetate -preparation and synthesis of succinic acid, crotonic acid, butanone, 4-methyl uracil and antipyrine from ethylacetoacetate.

UNIT III

Preparation of nitrobenzene. Reduction of nitrobenzene in acid, neutral and alkaline media. Electrolytic reduction of nitrobenzene. Preparation and properties of aliphatic primary, secondary and tertiary amines. Separation of amines by Hinsberg and Hofmann methods. Aniline - preparation and reactions. Basicity of aliphatic and aromatic amines. Preparation of benzene diazonium chloride, coupling reaction with aniline. Synthesis of phenol, benzene, benzoic acid, halo benzenes and nitrobenzene from benzene diazonium chloride.

UNIT IV

Heterocyclic compounds- preparation and reactions of pyrrole and pyridine. Comparison of basicities of pyridine and pyrrole. Synthesis and reactions of quinoline, isoquinoline and indole. Vitamins - classification, sources and deficiency diseases. Terpenoids-isolation and isoprene rule. Structural elucidation and synthesis of geraniol and α-terpeniol. Alkaloids - structural elucidation and synthesis of coniine and nicotine.

UNIT V

Molecular rearrangements-mechanisms of Pinacol-pinacolone, Beckmann, benzidine, Hoffmann, Curtius, Schmidt, benzil - benzilic acid, Claisen, Cope, Fries and Wolf rearrangements. (Applications not required)

Textbooks

1. B. S. Bahl and ArunBahl, Advanced Organic Chemistry, S. Chand & Company Ltd.

2. O. P. Agarwal, Reactions and Reagents, Krishna Prakashan Media (P) Ltd.

3. M. K. Jain, Modern Organic Chemistry, Vishal Publishing Co.

Programme: B.Sc., Chemistry Course code: **18UCH5C07**

Course Title: **Core: Physical Chemistry - I**

PART-III Year: III Semester: V Credits: 5 Total Hours: 5 x15 = 75

UNIT – I

Ohm's law and electrical units. Electrolysis – Faraday's law of electrolysis. Conductance of electrolytes - specific conductance, equivalent conductance and molar conductance - experimental determination of molar conductance. Types of electrolytes. Variation of specific and molar conductance with dilution. Transport number and ionic mobilities - determination of transport number - Hittorf's and moving boundary methods. Kohlrausch's law and its applications. Abnormal mobilities of hydrogen and hydroxyl ions.

UNIT – II

Arrhenius theory of electrolytic dissociation and its limitations. A qualitative discussion of interionic forces and their influence on conductance. Applications of conductance measurements - determination of solubility product, degree of dissociation, ionic product of water and conductometric titrations – acid-base and precipitation. Activity and activity coefficient of strong electrolytes (definition only).

UNIT – III

Dissociation of weak acids and bases – relative strengths. pH - definition, common ion effect and solubility product - applications of solubility product principle. Buffer solutions - types of buffers and buffer action - Henderson's equation. Hydrolysis of salts - hydrolysis constant and degree of hydrolysis of salts - weak bases and strong acids , weak acids and strong bases and weak acids and weak bases.

UNIT – IV

Electromotive force - electrochemical cells - galvanic cells - cell terminology - representation of cell - calculation of EMF of the cell. Reversible and irreversible cells - Weston standard cell. Experimental determination of EMF of a cell. Single electrode potential - determination. Electrochemical series - applications. Thermodynamic significance of electrode potential. Relation between EMF and thermodynamic quantities ΔG, ΔH, ΔS and their significance. Nernst equation for electrode and cell potentials. Types of electrodes - metal ion electrode, amalgam electrode, metal insoluble salt electrode (calomel and Ag/AgCl),oxidation reduction electrode, gas electrode (standard hydrogen electrode).

UNIT – V

Concentration cells - types - derivation of EMF of concentration cells with and without transference. Liquid Junction potential - definition (derivation not necessary) and its elimination. Application of EMF measurements - potentiometric titrations - acid base, precipitation and redox titrations – determination of solubility of a sparingly soluble salt, determination of pH using glass, quinhydrone and hydrogen electrodes. Commercial cells – Acid storage battery. Rechargeable cells – nickel cadmium and lithium ion cells. Fuel cells. Electrochemical principle of rusting of iron.

Textbooks

1. B. R .Puri and L. R. Sharma, Principles of Physical Chemistry, Vishal Publication.
2. ArunBahl, B.S. Bahl and G.D. Tuli, Essentials of Physical Chemistry, S. Chand and Company Ltd.
3. P.L. Soni and O. P. Dharmarha, Text Book of Physical Chemistry, Sultan Chand & Sons.

Programme: B.Sc., Chemistry Course code: **18UCH5EL1**

Course Title: **Elective:Spectroscopy**

PART-III Year: III Semester: V Credits: 4 Total Hours: 4 x15 = 60

UNIT-1

Atomic and molecular spectroscopy-absorption and emission spectra. Spectroscopy, spectrometry and spectrum. Electromagnetic radiation, wavelength, wave number, frequency and energy. Regions of electromagnetic spectrum and absorption of radiation by organic molecules. Different types of molecular energies. Different types of molecular spectroscopy. Microwave spectroscopy-principle and theory. Diatomic molecule as a rigid rotor-selection rule-instrumentation. Applications of rotational spectroscopy-structures of xenon oxyfluoride and benzonitrile.

UNIT-II

IR Spectroscopy -theory-molecular vibrations-vibrational frequency-force constant and vibrational energy-zero point energy- vibrational degrees of freedom for liner and non-liner molecules and selection rules. Factors affecting vibrational frequencies-coupled vibration, Fermic resonance and electronic effects. Instrumentation (block diagram only). Finger print region, overtones, combination and difference frequencies. Applications of IR spectroscopy-qualitative analysis (determination of functional groups)–inorganic complexes, geometrical isomerism, study of keto-enol tautomerism and distinction between two types of hydrogen bonding.

UNIT III

Electronic Spectroscopy- Beer's and Lambert's law. Theory of electronic spectroscopy-types of electronic transitions. Franck- Condon principle, Chromophores and auxochormes. Absorption and intensity shifts- bathochromic, hypsochromic, hyperchromic, and hypochromic shifts.Types of absorption bands. Instrumentation (block diagram only). Woodward-Fieser rules for calculating λ_{max} in conjugated and extended conjugated dienes and dienones. Applications to geometrical isomers.

UNIT IV

NMR Spectroscopy-theory- number of signals-equivalent and non-equivalent protons. Instrumentation (block diagram only). Chemical shift and TMS reference standard. Factors affecting chemical shift-shielding and deshielding-anisotropy with reference to ethylene, acetylene and benzene.Spin – Spin Coupling. Pascal's rule, Proton exchange.Rules of splitting signals-splitting of signals with reference to 1, 1, 2-tribromoethane, ethanol and acetaldehyde. Coupling constant (elementary idea only) NMR spectra of ethyl bromide, 2-chloropropane, acetamide, toluene and 1, 4-dioxane.

UNIT V

Mass Spectrometry- basic principles and theory. Instrumentation- Single focusing mass analyser-presentation of mass spectrum. Nitrogen rule-isotopic peaks, metastable ions and peak, molecular ion peak, base peak. Mc Lafferty rearrangement and Retro Diels - Alder reaction, double bond or ring equivalents Fragmentation associated with the following functional groups-ethanol, isopropyl alcohol, tert-butyl alcohol, diethyl ether, acetaldehyde, butyraldehyde, ethyl methyl ketone.

Text Books

1. Elementary organic Spectroscopy, Y. R. Sharma. S. Chand & Company Pvt . Ltd, New Delhi.
2. Organic Spectroscopy Principles and Applications, Jag Mohan, Narosa Publishing House, New Delhi.
3. Instrumental methods of Chemical Analysis, Chatwal and AnandHimalayan Publishing House.

Programme: B.Sc., Chemistry | Course code: **18UCH5CP3**

Course Title: **Core Practical: Basic concepts of Chemistry**

PART-III Year: III Semester: V Credits: 3 Self-Study Course

Basic concepts in

Atomic structure, chemical bonding, periodic properties, s and p block elements, transition elements, coordination compounds and nuclear chemistry.

Gaseous state, solid state, thermodynamics, chemical equilibrium, chemical kinetics, catalysis, colloids and electro chemistry

Isomerism, hydrocarbons, halogen compounds, hydroxy derivatives, carbonyl compounds, ethers, carbonyl compounds, carboxylic acids, nitro compounds, amines and diazonium salts.

Programme: B.Sc., Chemistry Course code: **18UCH6C08**

Course Title: **Core:Inorganic Chemistry-II**

PART-III Year: III Semester: VI Credits: 5 Total Hours: 5 x15 = 75

UNIT – I

Covalency and oxidation number, difference between oxidation number and valency. Rules for calculating oxidation number. Oxidation and reduction, common oxidising agents and reducing agents. Equivalent weight of common oxidising and reducing agents. Balancing redox equations using oxidation number method. Extraction of Mn, Co and Ni. Preparation, properties and uses of potassium permanganate, potassium dichromate and ferrous sulphate.

UNIT – II

Occurrence, extraction, chemical properties and uses of boron. Preparation, properties, structure and uses of diborane, sodium borohydride, boric acid, borax and boron nitride-borax bead test. Borazine-preparation, chemical properties and structure – comparison of borazine with benzene.

UNIT –III

Compounds of silicon-quartz, tridymite, cristobalite and carborundum. Silicates-types, structures and uses.

Isolation of noble gases from liquid air- Ramsey-Rleigh's method and Dewar's method - clathrate compounds-applications. Preparation, properties and structures of – XeF_2, XeF_4, XeF_6, XeO_3 and $XeOF_4$

Inter halogen compounds: preparation, properties, uses and structures of-ICl, IBr, ICl_3, IF_5 and IF_7.

UNIT –IV

Non-aqueous solvents-classification of solvents, characteristic properties of a solvent. Physical properties, chemical reactions, advantages and limitations of liquid ammonia, liquid hydrogen fluoride and liquid sulphur dioxide.

UNIT –V

Acids and Bases - Arrhenius concept, Lowry - Bronsted concept - conjugate acid - base pairs, Lewis concept. Relative strengths of acids and bases-effect of solvent, levelling effect-polarity and dielectric constant- effect of substituents-electron releasing, electron withdrawing nature of substituents, oxidation number of central atom, resonance effect. Hard and Soft Acids, Bases (HSAB) principle, and their applications.

Textbooks

1. R. D. Madan, Modern Inorganic Chemistry, S. Chand & Co.
2. B. R. Puri, L. R. Sharma and K. C. Kalia, Principles of Inorganic Chemistry, Milestone Publishers.
3. P. L. Soni Textbook of Inorganic Chemistry, S. Chand &Co.

Programme: B.Sc., Chemistry Course code: **18UCH6C09**

Course Title: **Core**:**Organic Chemistry -II**

PART-III Year: III Semester: VI Credits: 5 Total Hours: 5 x15 = 75

UNIT-I

Isomerism: structural and stereoisomerism - geometrical isomerism-Cahn – Ingold - Prelog rules for priority of groups, E-Z notation, and determination of configuration of geometrical isomers by physical and chemical methods. Optical isomerism, plane polarized light, chirality, enantiomers, diastereomers, anomers, epimers, optical isomerism in lactic acid and tartaric acid. R-S configuration.

UNIT-II

Conformational analysis - distinction between conformation and configuration. Conformations and potential energy diagrams of ethane and n-butane. Conformations of cyclohexane- chair, half chair, boat and twist forms. Methyl cyclohexane, conformations and stabilities of 1,2 –dimethylcyclohexane, 1,3 –dimethylcyclohexane and 1,4 –dimethylcyclohexane, conformations in cyclohexanol, cyclohexane-1,3- diol and cyclohexane-1,4,-diol.

UNIT-III

Free radicals-classification, generation of free radicals, detection of free radicals, configuration of free radicals and relative stabilities of alkyl free radicals. Stability of triphenylmethyl free radical, reactions involving free radicals-polymerization, allylic bromination by NBS, autoxidation, Sandmeyer reaction, Gomberg and Ullmann reactions.

UNIT-IV

Addition reactions of alkenes - electrophilic, nucleophilic and free radical addition reactions. Mechanisms of addition of H_2, halogens and hydrogen halides to carbon – carbon double bond systems, Markovnikov's rule and Kharasch-peroxide effect, cis-hydroxylation and hydroboration. Synthetic uses of diazomethane and perbenzoic acid.

UNIT-V

Carbohydrates- classification - elucidation of open chain structure of glucose and fructose, mutarotation, interconversions between glucose and fructose, reducing and non-reducing sugars. Amino acids and proteins: Amino acids-classification and general methods of preparation and properties. Peptide synthesis by Bergmann method, proteins-classification, primary and secondary and tertiary structures. Colour test for proteins.

Textbooks

1. ArunBahl and B. S. Bahl, Advanced Organic Chemistry, S. Chand & Co.
2. O.P.Agarwal, Reactions and Reagents, Goel publishing house, Meerut.
3. M. K. Jain, Modern Organic Chemistry, Vishal Publishing Co.

Programme: B.Sc., Chemistry Course code: **18UCH6C10**

Course Title: **Core:Physical Chemistry-II**

PART-III Year: III Semester: VI Credits: 5 Total Hours: 5 x15 = 75

UNIT – I

Phase rule – Definition of phase, component and degrees of freedom. Derivation of phase rule. Application of phase rule to one-component systems – phase diagrams of H_2O, CO_2 and sulphur systems. Application of phase rule to two component systems – lead-silver and zinc-magnesium systems. Phase diagrams for two component liquid systems – completely miscible and partially miscible (Phenol-water, triethylamine-water and nicotine-water) systems. Principle of steam distillation. Nernst distribution law and its applications.

UNIT – II

Chemical Kinetics: Definition of rate and rate constant dimensions of rate and rate constant. Order and molecularity – differences. Derivation of rate constants for zero, first and second order reactions. Examples for fractional and higher order reactions. Various methods of determining order of a reaction. Effect of temperature on reaction rate, Arrhenius equation – calculation of energy of activation.

UNIT – III

Simple collision theory – its limitations and modifications. Lindemann theory of unimolecular reactions. A qualitative discussion of absolute reaction rate theory (ARRT) using HI reaction- significance of entropy of activation, comparison of collision theory with ARRT. Catalysis – definition, types, characteristics of catalytic reactions, catalytic promoter, catalytic poison, auto catalyst, negative catalyst and induced catalyst. Energy of activation and catalysis. Theories of catalysis. Enzyme catalysis, lock and key and Michaleis - Menton (Derivation not required) mechanisms.

UNIT – IV

Absorption and adsorption – definitions – physisorption and chemisorption – difference. Adsorption isotherms – theory and derivation of Frendulich and Langmuir isotherms.Ion exchange adsorption – cationic exchange and anionic exchange. Applications of ion exchange adsorption – water softening and deionization of water.

UNIT – V

Photochemical reactions. Difference between photochemical and thermochemical reactions. Laws of photochemistry – Lambert Beer's, Grotthus Draper law and Stark Einstein's law. Quantum yield – definition and experimental determination (actinometry). Photochemical reactions of low and high quantum yields. Kinetics of hydrogen-bromine and hydrogen-chlorine reactions. Photosensitization and quenching. Definition of chemiluminescence, fluorescence and phosphorescence.

Textbooks

1. B. R .Puri and L. R. Sharma, Principles of Physical Chemistry, Vishal Publication.
2. ArunBahl, B. S. Bahl and G. D. Tuli, Essentials of Physical Chemistry, S. Chand and Company Ltd.
3. P. L. Soni and D. P. Dharmarha, Text Book of Physical Chemistry, Sultan Chand & Sons.
4. Gurdeep Raj, Advanced Physical Chemistry, Goel Publishing house.

Programme: B.Sc., Chemistry Course code: **18UCH6EL2**

Course Title: **Elective: Analytical Chemistry**

PART-III Year: III Semester: VI Credits: 5 Total Hours: 5 x15 = 75

UNIT -I

Storage and handling of chemicals - corrosive, inflammable, explosive, toxic, poisonous and carcinogenic chemicals. First aid procedures for laboratory accidents involving toxic and poisonous chemicals, electrical shock, cuts and burns from hot objects. Laboratory cleansing methods and cleaning agents. Interchangeable glass ground joint apparatus and their advantages. Calibration and grading of pipette, burette and volumetric flask.

UNIT -II

Evaluation of analytical Data- Errors - types-determinate indeterminate and gross errors. Errors in measurements - weighing, measuring solutions, titrations and gravimetric analysis. Absolute error and relative error. Precision and accuracy, difference between precision and accuracy. Significant figures, mean, median and mode, average, deviation-standard deviation. Confidence limits, Q-test, F- test and t-test. SI and derived units.

UNIT -III

Semimicro qualitative analysis - anions (interfering and non-interfering), reactions of some common anions (carbonate, sulphide, sulphate, nitrate, halides, oxalate, borate and phosphate), principle involved in the preparation of sodium carbonate extract and elimination of interfering anions. Classification of cations into groups, reactions of various cations, group reagents, solubility product and common ion effect.

UNIT -IV

Volumetric analysis - classification, standard solution, primary and secondary standard substances, concentration units. Acid-base titrations - choice of indicators and theory of acid base indicators. Redox titrations-self indicators and external indicators. Precipitation titrations - halides, thiocyanates, indicators of precipitation titrations. Complexometric titrations (EDTA titration only).

UNIT -V

Gravimetric analysis-methods of precipitation, conditions of precipitation, choice of precipitants. Types of organic precipitants, sequestering agents, solubility product and precipatation, factors affecting the solubility of precipitates, co-precipitation and post precipitation, procedure to minimise coprecipatation and post precipitation. Precipitation from homogeneous solution, Washing and drying of precipitates.

Text books

1. R. Gopalan, P.S.Subramanian, Elements of Analytical Chemistry & K. Rengarajan Sultan Chand & Sons
2. A. K. Srivastava & P. C. Jain, Instrumental Approach to Chemical AnalysisS. Chand Company Ltd
3. V. Venkateswaran, R. Veeraswamy, Basic Principles of Practical Chemistry & A. R. Kulandaivelu, Sultan Chand & Sons

Programme: B.Sc., Chemistry Course code: **18UCH6CP4**

Course Title: **Core Practical: Application Oriented**

PART-III Year: III Semester: V & VI Credits: 3 Total Hours: 3 x15 = 45

Water Analysis:

1. Determination of pH, Conductivity using water analysis kit.
2. Estimation of Calcium, Magnesium, Chloride and dissolved oxygen using water analysis kit.
3. Estimation of total dissolved solids (TDS & Gravimetric methods).
4. Estimation of total solids.
5. Estimation of total suspended solids.
6. Estimation of permanent hardness.
7. Estimation of temporary hardness.
8. Estimation of total hardness (EDTA method).

Industrial Analysis

1. Estimation of Hydrogenperoxide.
2. Estimation of available chlorine in bleaching powder.
3. Estimation of saponification value of oil.
4. Estimation of iodine value of oil.
5. Estimation of calcium in limestone.
6. Estimation of available or free CaO in industrial lime.
7. Separation of individual organic compounds in plant extract using Thin Layer and Column chromatography. (Demonstration only).

III – Soil Analysis Kit (demonstration only)

IV: Food additives and adulteration test (demonstration only)

V: Household things preparation (demonstration only)

1. Toiletries
2. Cosmetics

Textbooks

1. O. P. Vermani and A. K. Narula, Applied Chemistry Theory and Practice.
2. J. Bassett, R. C. Denney, G. H. Jeffery, J. Mendham, Vogel's Text Book of Quantitative Inorganic Analysis

Programme: B.Sc., Chemistry Course code: **18UCH6CP5**

Course Title:**Core**:**Practical-III**

PART-III Year: III Semester: V &VI Credits: 5 Total Hours: 6 x30 = 180

A. Gravimetric Analysis

1. Lead as lead chromate
2. Barium as barium chromate
3. Calcium as calcium oxalate monohydrate
4. Nickel as nickel dimethyl glyoxime complex
5. Magnesium as magnesium oxinate
6. Barium as barium sulphate (by insineration)
7. Lead as lead sulphate

B. Physical Chemistry Experiments

1. Determination of transition temperature of a hydrated salt
2. Determination of partition coefficient of Iodine between CCl_4 and H_2O
3. Determination of equilibrium constant for the reaction $KI + I_2 \rightleftharpoons KI_3$
4. Determination of critical solution temperature of phenol-water system
5. Determination of effect of impurity (NaCl) on CST of phenol-water system
6. Determination of effect of impurity (Succinic acid) on CST of phenol-water system
7. Determination of molecular weight by Rast's macro method
8. Phase diagram- simple eutectic system
9. Determination of rate constant of acid catalyzed hydrolysis of an ester
10. Kinetics of persulphate- Iodide reaction

Electrochemistry Experiments

11. Determination of cell constant
12. Determination of equivalent conductance of a strong electrolyte.
13. Conductometric titration- strong acid vs strong base
14. Conductometric titration- weak acid vs strong base
15. Potentiometric titration- Redox reaction [$KMnO_4$ vs Fe(II)]
16. Potentiometric titration- acid-base titration [HCl vs NaOH]

C. Demonstration Experiments

1. Polarimetry- Inversion of cane sugar

Reference Books

1. V. Venkateswaran, R. Veeraswamy and A. R. Kulandaivelu, Basic Principles of Practical Chemistry, Sultan Chand &sons.
2. A. O. Thomas, Practical Chemistry Scientific Book Centre, Cannanore.

Programme: B.Sc., Chemistry Course code: **18UCH6CP6**

Course Title: **Fundamentals of Practical Chemistry**

PART-III Year: III Semester: VI Credits: 3 Self-Study Course

The syllabus includes objective type questions to be evaluated by online examination from the fundamental aspects of

(i) Inorganic qualitative analysis
(ii) Organic qualitative analysis
(iii) Inorganic quantitative analysis including volumetric and gravimetric analyses
(iv) Physical chemistry practicals
(v) Inorganic and organic preparations

Reference Books

1. V. Venkateswaran, R. Veeraswamy and A. R. Kulandaivelu, Basic Principles of Practical Chemistry, Sultan Chand & Sons.
2. A. O. Thomas, Practical Chemistry Scientific Book Centre, Cannanore.

Programme: B.Sc., Chemistry Course code:**18UCH6CPR**

Course Title: **Project Work**

PART-III Year: III Semester: V & VI Credits: 5 Total Hours: 90 hours

Programme: B.Sc., Physics Course code:**18UPH3AL3**

Course Title: **Allied: Chemistry - I**

PART-III Year: II Semester: III Credits: 4 Total Hours: 4x15 = 60

Unit I:

Shapes of s and p orbitals, hybridization of carbon atom in CH_4, C_2H_4 and C_2H_2. Polar effects -Inductive effect, Electromeric effect, Resonance effect, Hyperconjugative effect and steric effect. Cis-Trans isomerism - inter-conversion of Maleic and Fumaric acids, Optical isomerism - Optical activity, Optical isomerism in Lactic acid andTartaric acid.

Unit II:

Molecular orbital theory - postulates, applications of Molecular Orbital theory to H_2, He_2, N_2 and O_2 molecules.Interhalogen compounds - Preparation, properties, structure and uses of ICl, BrF_3 and IF_5. Diborane- preparation, properties and structure.

Unit III:

Synthetic dyes: classification based on chemical constitution, preparation of methyl orange and malachite green. Chemotherapy - preparation and uses of sulpha drugs-prontosil, sulphadiazine and sulphafurazole. Structure and uses of Penicillin and Chloromycetin. Vitamins: Sources and deficiency diseases. Hormones: definition, classification - biological functions of oxytocin and insulin.

Unit IV:

Solutions: types, Raoult's law, deviation from ideal behaviour, binary liquid mixture, fractional distillation. Chemical Kinetics: order and molecularity, determination of order of a reaction, effect of temperature on reaction rate, activation energy. Concept of chromatography: principles and applications of thin layer, column and paper chromatography.

Unit V:

Silicones: synthesis, properties and uses. Fuel gases: natural gas, water gas, semi-water gas, producer gas, oil gas and gobar gas.Preparation and uses of fertilizers -ammonium sulphate, urea, superphosphate of lime and triple super phosphate. Pollution - air, water and soil pollutions, sources and their control - acid rain, ozone layer depletion and greenhouse effect.

Text Book:

1. V. Veeraiyan&A.N.S.Vasudevan,Allied Chemistry Paper I & II, High MountPublishing House (2005).

Programme: B.Sc., Physics Course code:**18UPH4AL4**

Course Title: **Allied: Chemistry - II**

PART-III Year: II Semester: III Credits: 4 Total Hours: 4x15 = 60

Unit I:

Coordination chemistry: Nomenclature of mono-nuclear complexes, Werner's theory, Sidgwick's EAN rule, Pauling's theory applied to $K_4[Fe(CN)_6]$, $K_3[CoF_6]$, $[Ni(CO)_4]$ and $K_2[Ni(CN)_4]$. Chelation and industrial applications of EDTA. Biological role of hemoglobin and chlorophyll.

Metals: Ore dressing, reduction to free metals, refining of crude metals. Furnaces - kilns, Muffle furnace, blast furnace, electric furnace and reverberatory furnace. Metallurgy of copper.

Unit II:

Aromatic compounds: Aromaticity, Aromatic electrophilic substitution reactions - halogenation, nitration, alkylation, acylation and sulphonation.Isolation, preparation, properties and structural elucidation of naphthalene.Preparation and properties of pyrrole, furan and thiophene.

Unit III:

Amino acids – classification, preparation and properties.Bergmann synthesis of polypeptides. Proteins – classification, properties and biological functions. Carbohydrates - Classification, preparation and properties of glucose and fructose.

Unit IV:

Energetics – Types of systems and processes. Statement of the first law of thermodynamics and need for the second law. Carnot cycle and efficiency of a heat engine.Joule-Thomson effect, Enthalpy and free energy relationships.

Phase equilibria-definition of phase, component and degrees of freedom. Phase rule (derivation notnecessary). Phase diagrams- water system and lead-silver system.

Unit V:

Electrochemistry: conductance-definition, Kohlrausch law and its application, conductometric titrations, electroplating. Galvanic cells: EMF, standard electrode potential, hydrogen electrode, calomel electrode and glass electrode. pH definition and its determination by EMF method. Buffer solution: definition, buffer action, buffer solutions in biological systems.

Text Book:

1. Dr. V.Veeraiyan&A.N.S.Vasudevan, Allied Chemistry Paper I & II, HighMountPublishing House (2005).

Programme: B.Sc., Physics Course code:**18UPH4AP1**

Course Title: **Allied Practical: Chemistry**

PART-III Year: II Semester: III & IV Credits: 2 Total Hours: 2x15 = 30

A. VOLUMETRIC ANALYSIS

ACIDIMETRY- ALKALIMETRY

1. Estimation of Sodium Carbonate
2. Estimation of Sodium hydroxide
3. Estimation of Sodium Carbonate and sodium bicarbonate in a mixture – Warder's method
4. Estimation of Oxalic acid
5. Estimation of Hydrochloric acid
6. Determination of hardness of water PERMANGANAMETRY
7. Estimation of Mohr's salt
8. Estimation of Ferrous sulphate
9. Estimation of Oxalic acid 10. Estimation of Hydrogen peroxide DICHROMETRY
11. Estimation of Ferric iron (Internal indicator method)
12. Estimation of Ferrous iron (Internal indicator method) IODOMETRY
13. Estimation of Potassium dichromate
14. Estimation of Potassium permanganate
15. Estimation of Copper

B. ORGANIC ANALYSIS

1. Detection of elements (N, S, halogens)
2. To distinguish between aliphatic or aromatic, saturated or unsaturated compounds
3. Functional groups tests for phenols, aromatic amines, aromatic acids, amides and carbohydrates

Text Book:

1. V.Venkateswaran, R. Veeraswamy and A. R. Kulandaivelu, Allied Practical Chemistry by S. Chand & Company Ltd., Ramnagar, New Delhi, (2001)

Programme: B.Sc., Physics Course code:**18UPH3NM1**

Course Title:**NME**: **Solid state chemistry-I**

PART-IV Year: II Semester: III Credits: 2 Total Hours: 2x15 = 30

Unit I:

Characteristics of solids - difference between crystalline and amorphous solids-crystal lattice-unit cells-seven crystal systems, Bravais lattices - Weiss and Miller indices. Derivation of Bragg's law - determination of crystal structure by rotating crystal method using X ray diffraction. Types of crystals-ionic, covalent, molecular and metallic crystals.

Unit II:

Defects in crystalline solids- stoichiometric and non-stoichiometric defects-Schottky, Frenkel, metal deficiency and metal excess defects and their consequences. Structure of AX type ionic solids-sodium chloride, Zinc blende and Wurtzite structure. Liquid crystals-smetic, nematic and choleric liquid crystals. Applications of liquid crystals.

Unit III:

Electrical properties of crystals ferroelectricity, pyroelectrocity and anti-ferroelectricity. Magnetic properties of crystals- magnetic moment, magnetic susceptibility and its measurement by Guoy's method. Intrinsic and extrinsic semiconductors-Applications of band theory to conductors, insulators, p-type and n-type semiconductors. Applications of semiconductors.

Text Books:

1. B. R. Puri and L. R. Sharma, Principles of Inorganic Chemistry, Milestone Publication (2011.
2. B. R .Puri and L. R. Sharma, Principles of Physical Chemistry, Vishal Publication (2011).
3. P. L. Soni, O. P. Dharmarha and U. N Dash. Text Book of Physical Chemistry Sultan Chand & Sons, (2009).

Programme: BA/B.Sc. Course code:**18UCH4NM2**

Course Title: **NME: Health Awareness and Management**

PART-IV Year: II Semester: IV Credits: 2 Total Hours: 2x15 = 30

Unit I: (Human Anatomy and Physiology - Elementary level)

Definition of anatomy and physiology. Functions of various systems-skeletal, muscular, nervous, endocrine, cardiovascular, respiratory, digestive, urinary, lymphatic and circulatory systems.

Unit II:

Food and Nutrients:Food and nutrients-b**alanced diet, and food pyramid. F**unctions, sources, deficiency and excess of proteins, carbohydrates, fats, minerals (iodine, iron, calcium, phosphorous, potassium & sodium), vitamins (water-soluble and fat-soluble), water and fiber.

Diet in management: Diet for obesity, underweight, hypertension, diabetes, heart disease, gastro-intestinal diseases and urological disorders.

Diagnosis and screening:Normal range of physiological and biochemical parameters in blood and urine for good health. Blood glucose, lipid and kidney profile. BP, CBC, BMI, body temperature. Basic understanding of X-ray, CT scan, MRI, endoscopy, laparoscopy, biopsy and autopsy.

Unit III:

Diseases and health disorders:Communicable disease- non-communicable disease.**Symptoms and causes of some common diseases:**dengue, swine-flu, chikungunya, malaria, chicken pox, tuberculosis, thyroiddisease, diabetes, kidney stones, obesity, hypertension, Alzheimer's disease and ulcer.

Life style health disorders**:**Aids, smoking, depression, drug and alcohol abuse.

Public health awareness and hygiene: Personal hygiene, vaccination, women and childcare, environmental cleanliness, solid-waste management, health insurance, first aid and emergency medical care.

References:

1. Principles of Anatomy and Physiology, Gerard J. Tortora and Sandra Reynolds, 10th Ed., John Wiley & Sons.
2. Modern Nutrition in Health and Disease, A. Catharine and Benjamine Caballero, 11thEd. LWW publications.
3. Fundamentals of Clinical Trials,Lawrence and M. Friedman, 4thEd. Springer publications.
4. NCERT resources: http://ncert.nic.in/ebooks.html