

MAHENDRA ARTS & SCIENCE COLLEGE (AUTONOMOUS)

[NAAC Accredited with 'A' Grade & Recognized u/s 2(f) and 12B of the UGC act 1956]
(Affiliated to Periyar University)

Kalippatti, Namakkal – 637 501.



DEPARTMENT OF CHEMISTRY

B.Sc., (Chemistry) – SYLLABUS

Choice Based Credit System

For the Students Admitted from the Academic Year 2016 - 2017 Onwards

REGULATIONS

1. Objectives of the Course:

1. To impart knowledge in fundamental aspects of all branches of Chemistry.
2. To acquire basic knowledge in the specialized areas like Polymer Chemistry, Environmental Chemistry, Dye Chemistry, Pharmaceutical Chemistry etc.,
3. To create manpower in Chemical industries and help their growth.
4. To prepare candidates for a career in Chemical industries.

2. Eligibility for Admission:

A candidate who has passed the Higher Secondary Examination of Tamilnadu Higher Secondary Board or an examination of some other board accepted by the syndicate as equivalent there to with Chemistry and Physics and any one of the following subjects namely Maths, Botany, Zoology or Biology shall be eligible for admission into B.Sc., course in Chemistry.

3. Duration of the Course:

The duration of the course is THREE academic years divided into six semesters under Choice Based Credit System.

4. Features of CBCS:

Under Choice Based Credit System (CBCS), a set of papers consisting of Core papers, Elective papers, Skill based elective papers and Non-major elective papers are offered. Beside the Core Papers, which are totally related to the major subject, the students have the advantage of studying supportive papers and non-major papers. This provides enough opportunity to the students to learn not only the major subject but also interdisciplinary and application oriented subjects.

5. Credits:

In CBCS, each paper is assigned with a certain number of Credits depending upon the workload of the students. The total Credits to be earned by a student to qualify for the degree is above 140. The credit of the paper is fixed by giving due weightage to the syllabus content and contact hours per week

6. Evaluation Procedure:

Evaluation is based on Continuous Internal Assessment (CIA) test and University Examination. Distribution of marks as follows

THEORY

University examination (UE)	Internal Assessment (IA)
75 marks	25 marks

PRACTICAL

University examination (UE)	Internal Assessment (IA)
60 marks	40 marks

7. Pattern of Question Paper (For both Major & Allied):

THEORY

Time: 3 Hours

Maximum - 75 Marks

SECTION – A

(Answer ALL Questions)

(10 x 2= 20 Marks)

All Question Carry equal marks-2 questions from each unit

SECTION – B

(Answer ALL Questions)

(5 x 5 = 25 Marks)

(Internal Choice)

All Questions carry equal marks-2 questions from each unit.

SECTION – C

(Answer any THREE out of five)

(3 x 10=30 Marks)

1 question from each unit

All units in the syllabus should be given equal weightage.

8. Model Question Paper:

SEMESTER - I

B.Sc. Chemistry

General Chemistry –I

Time: 3 Hours

Maximum - 75 Marks

Section A (10 x 2 = 20 Marks)

Answer **ALL** questions.

1. What are the four quantum numbers?
2. Write the Schrödinger's wave equation.
3. Write Aufbau principle.
4. Define electro negativity and what is its variation along the period ?
5. Explain hyper conjugation.
6. State and Explain Wurtz reaction.
7. Define collision diameter.
8. What is root mean square velocity?
9. What is a primary standard? Give 2 examples.
10. What is the colour of phenolphthalein in acidic and alkaline medium? Why?

Section-B (5 x 5 =25 Marks)

Answer **ALL** questions.

11. a) Derive de Broglie equation and give its significance.
(or)
b) What is the Significance of Ψ and Ψ^2 in Schrodinger wave equation?
12. a) How are atomic and ionic radii varies along the period and group in a periodic table?
(or)
b) Write the characteristic properties of 's' block elements.
13. a) Compare the acidity of CCl_3COOH , CH_2ClCOOH , CH_3COOH and explain.
(or)
b) Why is Aniline less basic than aliphatic amines?
14. a) What are most probable and Average Velocity ?
(or)
b) How is kinetic energy related with temperature?
15. a) How is solubility product principle helpful in qualitative analysis?
(or)
b) i) How many moles of NaOH is there in 40 g of it?
ii) Calculate the normality of NaOH when 20g of it is dissolved in one litre of water.

Section - C (3x10=30 Marks)

Answer **ANY THREE** questions:

16. a) Explain Bohr's atom model.
b) Explain Heisenberg's Uncertainty principle.
17. a) Write the characteristic principles of 'd' block elements.
b) What is Pauli's exclusion principle?
18. Write notes on (i) Diels Alder reaction.
(ii) Synthesis and uses of 1,3-butadiene
19. a) Write note on Boyle temperature.
b) Derive the relation between coefficient of expansion and compressibility.
20. a) Write the theory behind acid-base titration.
b) How chloride is detected with Sodium Carbonate extract?

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DEPARTMENT OF CHEMISTRY

B.Sc., CHEMISTRY - COURSE STRUCTURE (CBCS Pattern 2016 - 2017 Onwards)

SEM	Part	Course Title	Sub Code	Credits	Hr/ Week	Marks		Total
						IA	EA	
I	I	Tamil – I	M16UFTA01	3	6	25	75	100
		Hindi – I	M16UFHI01		6	25	75	100
	II	English – I	M16UFEN01	3	6	25	75	100
	III	General Chemistry – I	M16UCH01	5	6	25	75	100
		Allied – I - Mathematics – I	M16UMAA01	4	7	25	75	100
		Practical – I - Volumetric Analysis & Inorganic Practical	M16UCHP01	-	3	-	-	-
	IV	Value Education – Yoga	M16UVE01	2	2	25	75	100
				17				
II	I	Tamil – II	M16UFTA02	3	6	25	75	100
		Hindi – II	M16UFHI02		6	25	75	100
	II	English – II	M16UFEN02	3	6	25	75	100
	III	General Chemistry – II	M16UCH02	5	5	25	75	100
		Allied – II - Mathematics – II	M16UMAA02	4	4	25	75	100
		Practical – I - Volumetric Analysis & Inorganic Practical	M16UCHP01	5	3	40	60	100
		Allied Practical - I – Mathematics	M16UMAAP01	3	2	40	60	100
	IV	SBEC - I - Every Day Chemistry	M16UCHS01	2	2	25	75	100
Value Education - Environmental Studies		M16UES01	2	2	25	75	100	
				27				
III	I	Tamil – III	M16UFTA03	3	6	25	75	100
		Hindi – III	M16UFHI03		6	25	75	100
	II	English – III	M16UFEN03	3	6	25	75	100
	III	General Chemistry – III	M16UCH03	5	4	25	75	100
		Allied - III – Physics - I	M16UPHA01	4	4	25	75	100
		Practical – II - Inorganic Qualitative Analysis	M16UCHP02	-	3	-	-	-
		Allied Practical - II – Physics	M16UPHAP01	-	3	-	-	-
	IV	SBEC - II	M16UCHS02	2	2	25	75	100
IV	NMEC – I	M16UMAN02	2	2	25	75	100	
				19				
IV	I	Tamil – IV	M16UFTA04	3	6	25	75	100
		Hindi – IV	M16UFHI04		6	25	75	100
	II	English – IV	M16UFEN04	3	6	25	75	100
	III	General Chemistry – IV	M16UCH04	5	4	25	75	100
		Allied – IV - Physics – II	M16UPHA02	4	4	25	75	100
		Practical – II - Inorganic Qualitative Analysis	M16UCHP02	5	3	40	60	100
		Allied Practical – II – Physics	M16UPHAP01	3	3	40	60	100
	IV	SBEC – III – Food and Nutrition	M16UCHS03	2	2	25	75	100
IV	NMEC – II	M16UMAN03	2	2	25	75	100	
				27				
V	III	Inorganic Chemistry I	M16UCH05	5	4	25	75	100
		Organic Chemistry- I	M16UCH06	5	4	25	75	100
		Elective - I - Physical Chemistry – I	M16UCHE01	4	5	25	75	100
		Elective - I – Polymer Chemistry	M16UCHE02			25	75	100
		Elective - I – Material Science	M16UCHE03			25	75	100
		Elective - I – Chromatographic Techniques	M16UCHE04			25	75	100
		Elective – II – Analytical Chemistry	M16UCHE05	4	5	25	75	100
		Elective – II – Drug Discovery	M16UCHE06			25	75	100
		Elective – II – Diary Chemistry	M16UCHE07			25	75	100
		Elective – II – Medicinal Chemistry	M16UCHE08			25	75	100
		Practical – III - Physical Chemistry Experiments	M16UCHP03	-	3	-	-	-
		Practical – IV - Gravimetric and Organic Analysis	M16UCHP04	-	5	-	-	-

	IV	SBEC - III – Pharmaceutical Chemistry	M16UCHS04	2	2	25	75	100	
		SBEC - IV – Green Chemistry	M16UCHS05	2	2	25	75	100	
				22					
VI	III	Inorganic Chemistry – II	M16UCH07	5	5	25	75	100	
		Organic Chemistry – II	M16UCH08	5	5	25	75	100	
		Elective - III - Physical Chemistry - II	M16UCHE09	4	5	25	75	100	
		Elective - III – Bio-Inorganic Chemistry	M16UCHE10			25	75	100	
		Elective - III – Chemistry of Natural Products	M16UCHE11			25	75	100	
		Elective - III – Conductors and Semiconductors	M16UCHE12			25	75	100	
		Elective - IV – Spectroscopy	M16UCHE13	4	4	25	75	100	
		Elective - IV – Corrosion Science	M16UCHE14			25	75	100	
		Elective - IV - Forensic Chemistry	M16UCHE15			25	75	100	
		Elective - IV – Catalysis	M16UCHE16			25	75	100	
	Practical – III - Gravimetric and Organic Analysis	M16UCHP03	5	3	40	60	100		
	Practical – IV - Physical Chemistry Experiments	M16UCHP04	5	6	40	60	100		
	IV	Value Added – Comprehensive Chemistry	M16UVA07	1	2	100	-	100	
		Extension Activities	M16UEX01	1	-	-	-	-	
				30					
Total Credits				142					

SEMESTER – I

Part	Course Title	Sub Code	Credits	Hr/ Week	Marks		Total
					IA	EA	
I	Tamil – I	M16UFTA01	3	6	25	75	100
	Hindi – I	M16UFHI01		6	25	75	100
II	English – I	M16UFEN01	3	6	25	75	100
III	General Chemistry – I	M16UCH01	5	6	25	75	100
	Allied Mathematics – I	M16UMAA01	4	7	25	75	100
	Practical – I – Volumetric Analysis & Inorganic Practical	M16UCHP01	-	3	-	-	-
IV	Value Education – Yoga	M16UVE01	2	2	25	75	100
			17				

MAJOR	B.Sc. Chemistry	2016-2017
M16UCH01	GENERAL CHEMISTRY-I	
Credits: 5		

UNIT-I: Atomic Structure and Periodic Table

Electronic configuration: Bohr theory, dual nature of electrons: de Broglie equation, orbit and orbital, shape of orbitals, Heisenberg uncertainty principle, Pauli's exclusion principle, Hund's rule, sequence of energy levels (Aufbau principle), quantum numbers.

Periodic properties- atomic radius: covalent, Vander Waals and ionic radii – cautionary word on radius ratio- effective nuclear charge- ionic radii of isoelectronic ions- ionization energy(IE)- factors affecting IE –periodic variation of IE – comparison of IE of N and O; Mg and Al; Be and B. Electron affinity – periodic variation - electron affinity of halogens. Electronegativity and its applications in predicting bond character.

UNIT-II: Chemical Bonding and Chemical Reactions

Types of bonding- ionic bonding & covalent bonding: oxidation states and Lewis symbol, Valence Bond Theory: Hybridization of Atomic Orbitals: sp Hybridization, sp² Hybridization, sp³ Hybridization, sp³d and sp³d² Hybridization, Assignment of Hybrid Orbital to central atoms, Hybridization involving double and triple bonds.

VSEPR theory and model-study of small inorganic molecules-BF₃, BF₄⁻, NH₃, H₂O, PCl₅, ClF₃, I₃, SF₆, XeO₄, BrF₅.

UNIT – III: Gaseous State

Pressure of a gas, Boyle's law, Charles law, Kelvin temperature scale, Avagadro's law, ideal gas equation, standard conditions of T & P, definition and molecular masses of gases, Dalton's law, Graham's law.

Kinetic theory of gases, molecular velocities-mean Square, average and most probable velocities-deviations from ideal gas behavior, real gases, collision number, mean free path, collision diameter and collision frequency.

UNIT-IV: Basic Concepts in Organic Chemistry

Electron displacement effects - inductive - inductomeric - electromeric – mesomeric effect - resonance - hyperconjugation and steric effects.

Cleavage of bonds - Homolytic and Heterolytic fission of carbon-carbon bond - Methods for determining reaction mechanism – nucleophile, electrophile and leaving group-Reaction intermediates - Structure and stability of Carbocations - Carboanions and Free radicals.

UNIT-V: Chemical Stoichiometry

Atomic and molecular masses, moles of atoms, Avagadro's number, moles of molecules. Definitions of molarity - normality - molality and mole fraction - their calculations - definition and examples for primary and secondary standards. Calculation of equivalent weight of acid, base, oxidizing agent, reducing agent and salt.

REFERENCES

1. B.R. Puri, L.R. Sharma, K.C. Kalia, *Principle of Inorganic Chemistry*, Vallabh Publications, 2004.
2. P.L. Soni, M. Katyal, *Text book of Inorganic Chemistry*, Sulan Chand ans Son, 1986.
3. Gurdeep Raj, *Advanced Inorganic Chemistry*, Goel Publishing house, 1986.
4. Satya Prakash, S. Modern, *Inorganic Chemistry*, S. Chand and Company Ltd., 2003.
5. Wahid U. Malik, G. D. Tuli, R.D. Madan, *Selected Topics in Inorganic Chemistry*, S. Chand and Company Ltd., 2001.
6. J.D. Lee, *Concise Inorganic Chemistry*, Blackwell Science, 5th Edn., 1996.
7. P.L. Soni, *Text book of Organic Chemistry*, Sulan Chand ans Son, 1986.
8. Arun Bhal, B.S. Bahl, *Advanced Organic Chemistry*, S. Chand and Company Ltd., 2003.
9. F. A. Cotton, G. Wilkinson and P. L. Guas, *Basic Inorganic Chemistry*, 3rd ed., John Wiley, 1994.
10. B. Y. Paula, *Organic Chemistry*, 3rd ed., Pearson Education, Inc.(Singapore), New Delhi, reprint, 2002.

SEMESTER – II

Part	Course Title	Sub Code	Credits	Hr/ Week	Marks		Total
					IA	EA	
I	Tamil – II	M16UFTA02	3	6	25	75	100
	Hindi – II	M16UFHI02		6	25	75	100
II	English – II	M16UFEN02	3	6	25	75	100
III	General Chemistry – II	M16UCH02	5	5	25	75	100
	Allied – II - Mathematics – II	M16UMAA02	4	4	25	75	100
	Practical – I - Volumetric Analysis & Inorganic Practical	M16UCHP01	5	3	40	60	100
	Allied Practical - I – Mathematics	M16UMAAP01	3	2	40	60	100
IV	SBEC – I – Every Day Chemistry	M16UCHS01	2	2	25	75	100
	Value Education - Environmental Studies	M16UES01	2	2	25	75	100
			27				

MAJOR	B.Sc. Chemistry	2016-2017
M16UCH02	GENERAL CHEMISTRY-II	
Credits: 5		

UNIT-I: Thermodynamics-I

Chemical thermodynamics – system – surroundings – isolated, closed and open systems – Homogeneous and heterogeneous systems – state of the system –thermodynamic equilibrium- intensive and extensive properties – thermodynamic process – cyclic process – reversible and irreversible process – isothermal, isobaric, isochoric and adiabatic process – state and path functions – concept of heat and work .

First law of thermodynamics – statement – definition of internal energy (U), enthalpy (H) and heat capacity – U and H as thermodynamic properties–relationship between C_p and C_v – calculation of W, q, dU and dH for expansion of ideal and real gases under isothermal and adiabatic conditions for reversible and irreversible process – Joule Thomson effect – calculation of Joule Thomson coefficient for ideal and real gases – inversion temperature – Zeroth law of thermodynamics – Absolute scale of temperature.

UNIT – II: Introduction to Nuclear Chemistry

- Introduction - composition of nucleus - nuclear forces operating between the nucleons- Nuclear binding energy - Mass defect - simple calculations involving mass defect and binding energy per nucleon - N/P ratio, curves, stability belts- magic numbers.
- Natural radioactivity - radioactive series including neptunium series - Rate of disintegration and half - life period - Average life period.
- Artificial radioactivity - induced radioactivity - nuclear fission - nuclear energy - nuclear reactors - nuclear fusion - energy source of the sun and stars.

UNIT – III: MOT, Metallic and Weak Bonds

- Molecular Orbital Theory: linear combination of atomic orbital (LCAO) method, rules of LCAO, Molecular Orbitals, Molecular Orbital energy diagrams, Bond order, H_2 , He_2 , N_2 , O_2 , C_2 , NO and He_2^+ Molecules. Isoelectronic principle.
- Weak bonds: Hydrogen bonding-intra- and intermolecular hydrogen bonding, influence on the physical properties of molecules, comparison of hydrogen bond strength and properties of hydrogen bonded N, O, and F compounds; crystalline hydrates and clathrates.

UNIT IV: Introduction to Organic Chemistry

- Introduction to functional groups, structure and bonding; - Hybridization - tetravalency of carbon - geometry of molecules - methane, ethane, ethylene, acetylene and benzene. isomers, nomenclature of alkyl substituents, alkanes, cyclo alkanes, alkyl halides, alcohols, ethers, amines and Intermolecular forces like Vander Waals

forces, dipole – dipole, hydrogen bonds-solubility-dipole moments of molecules-introduction acids and bases, factors affecting acidity and basicity.

UNIT – V: Organic Reaction Mechanisms

- Types of organic reactions – Alkanes - Methods of preparation of alkanes –Wurtz method, Kolbe’s method and reduction of alkyl halides. Physical and chemical Properties of alkanes - Mechanism of free radical substitution in alkanes – Halogenation and reactivity.
- Alkenes - Properties of alkenes – Electrophilic and Free radical addition. Addition reactions of alkenes with mechanism- addition of hydrogen, halogens, hydrogen halide (Markownikoff's rule), hydrogen bromide (peroxide effect), sulphuric acid , water, BH_3 , O_3 , hydroxylation with KMnO_4 - allylic substitution by NBS..

REFERENCES

1. B.R. Puri, L.R. Sharma, K.C. Kalia, *Principle of Inorganic Chemistry*, Vallabh Publications, 2004.
2. P.L. Soni, M. Katyal, *Text book of Inorganic Chemistry*, Sulan Chand ans Son, 1986.
3. Gurdeep Raj, *Advanced Inorganic Chemistry*, Goel Publishing house, 1986.
4. Satya Prakash, S. Modern, *Inorganic Chemistry*, S. Chand and Company Ltd., 2003.
5. Wahid U. Malik, G. D. Tuli, R.D. Madan, *Selected Topics in Inorganic Chemistry*, S. Chand and Company Ltd., 2001.
6. J.D. Lee, *Concise Inorganic Chemistry*, Blackwell Science, 5th Edn., 1996.
7. P.L. Soni, *Text book of Organic Chemistry*, Sulan Chand ans Son, 1986.
8. Arun Bhal, B.S. Bahl, *Advanced Organic Chemistry*, S. Chand and Company Ltd., 2003.

PRACTICAL-I	B.Sc. Chemistry	2016-2017
M16UCHP01	VOLUMETRIC ESTIMATIONS & INORGANIC PRACTICAL	
Credits: 5		

PART-I

ESTIMATIONS

1. Acidimetry – Alkalimetry

- a) Estimation of sodium hydroxide – Standard sodium carbonate.
- b) Estimation of Oxalic acid – Standard Oxalic acid.

2. Permanganometry

- a) Estimation of ferrous iron - Standard Oxalic acid.

3. Dichrometry

- a) Estimation of ferrous iron using diphenylamine internal indicator - Standard FeSO₄.

4. Iodometry and Iodimetry

- a) Estimation of potassium dichromate – Standard K₂Cr₂O₇

5. Complexometric Titrations

- a) Estimation of Zn and Mg using EDTA.

PART-II

INORGANIC PREPARATIONS

- a) Ferrous ammonium sulphate.
- b) Potassium trioxalato chromate(III)
- c) Tetraammine copper(II) Sulphate.
- d) Microcosmic salt.

REFERENCES

1. Bassett.J, Denney.R.C, Jaffery.G.H and Mendhan.J, *Vogel's Hand Book of Quantitative Inorganic Analysis ELBS* – Longman.
2. Venkateswaran.V, Veerasamy.R, and Kulandaivelu.R, *Basic Principles of Practical Chemistry*.

SBEC-I	B.Sc. Chemistry	2016-2017
M16UCHS01	EVERYDAY CHEMISTRY	
Credits: 2		

UNIT – I: Chemistry of Water

Impurities in water – Hardness of water and its disadvantages – Prevention of scale formation (softening of water) – Portable water (water for domestic supply).

UNIT – II: Industrial Chemistry

Cement – Manufacture of Portland cement – Special cements – Mortars and Concretes. Rubber – Vulcanization – Uses of rubber, Explosives – Classification of Propellants and Rocket fuels – Properties of a good propellant.

UNIT – III: Fuels

Coal – Classification of coal. Petroleum – Origin – Classification – Refining – Cracking – Knocking – Leaded Petrol. Diesel oil – Non petroleum fuels – Natural gas – Liquid Petroleum Gas (LPG).

UNIT – IV: Pharmaceutical Chemistry

Drugs – Nature, Source and study of drugs – Classification of drugs. Anesthetics – Antiseptics – Disinfections – Antibiotics – Preservatives – Antioxidants- anti-inflammatory drugs.

UNIT – V: Biological Chemistry

Vitamins – Fat and Water soluble – Physiological functions. Chemistry of Oils, Soaps and Detergents. Clinical chemistry – presence of glucose in blood and urine – Cholesterol in urine diabetes – anemia – blood pressure.

REFERENCE BOOKS

1. Krishnamurthy. N., Jayasubramanian. K and Vallinayagam (1990), Applied Chemistry.
2. Jayashree Ghosh (1999), A Text Book of Pharmaceutical Chemistry.

SEMESTER - III

Part	Course Title	Sub Code	Credits	Hr/ Week	Marks		Total
					IA	EA	
I	Tamil - III	M16UFTA03	3	6	25	75	100
	Hindi - III	M16UFHI03		6	25	75	100
II	English - III	M16UFEN03	3	6	25	75	100
III	General Chemistry – III	M16UCH03	5	4	25	75	100
	Allied - III – Physics - I	M16UPHA01	4	4	25	75	100
	Practical – II - Inorganic Qualitative Analysis	M16UCHP02	-	3	-	-	-
	Allied Practical - II - Physics	M16UPHAP01	-	3	-	-	-
IV	SBEC – II- Industrial Chemistry	M16UCHSO2	2	2	25	75	100
IV	NMEC – I	M16UMAN02	2	2	25	75	100
			19				

MAJOR	B.Sc. Chemistry	2016-2017
M16UCH03	GENERAL CHEMISTRY-III	
Credits: 5		

UNIT – I: Hydrogen and Hydrides, Alkali and Alkaline earth Metals

- Hydrogen : Electronic structure, position in the periodic table, abundance, preparation and properties, isotopes, ortho- and para hydrogen; Hydrides: ionic, covalent, metallic and intermediate hydrides.
- Alkali metals: Introduction, reaction with water, halides, oxides and hydroxides, salts of oxo-acids, organometallic compounds and biological importance.
- Alkaline Earth metals: Introduction, halides, oxides and hydroxides, salts of oxo-acids, organometallic compounds biological importance of Mg^{2+} and Ca^{2+}

UNIT – II: Boron and Carbon group – Basic treatment

- Boron group: Introduction, diborane and hydrogen compounds of the other elements, metal borides, halides of B, Al, Ga, In and Tl, oxides, oxo-acids, oxo-anions and hydroxides of boron; nitrogen derivatives of boron; organometallic compounds.
- Carbon group: Introduction, allotropy of elements, Intercalation compounds of graphite, hydrides, carbides and silicides, halides; oxides and oxo-acids of carbon; oxides and oxo-acids and hydroxides of Si, Ge, Sn and Pb; Silicones; Sulfides; Cyanogen, its derivatives and silicon nitride; Organometallic compounds.

UNIT-III: Second and Third Law of Thermodynamics

- Second law of Thermodynamics – need for the law – Different statements of II law - Heat engine – Carnot’s cycle and its efficiency – Thermodynamic scale of temperature – Entropy as a state function – Entropy as a function of P, V and T - Entropy change in phase change – Entropy of mixing – Entropy as a criterion of spontaneous and equilibrium processes in isolated systems – Gibbs function(G) – Helmholtz function(A) as thermodynamic quantities - ΔA and ΔG as criteria for thermodynamic equilibrium and spontaneity – Their advantage over entropy change-variation of ΔA and ΔG with P, V and T – Gibbs Helmholtz equations and their applications – Maxwell’s relations.

UNIT IV: Chemistry of aromatic hydrocarbons

- Aromaticity, Huckel Rule, resonance energy, anti aromaticity, non-aromatic, consequences of aromaticity, Benzene structure and its aromatic electrophilic substitution reactions: halogenation, nitration, sulphonation, Friedel – Crafts alkylation and acylation, Activity and orientation of substituted benzenes-Naphthalene structure and reactions.

UNIT –V: Solid State

- Isotropic and anisotropic solids – Interfacial angle – symmetry elements in crystal systems – Bravais lattices - Unit cell – law of rational indices (Weiss indices), Miller indices – unit cell dimension – density – number of atoms per unit cell – X-ray diffraction by crystals – derivation of Bragg's equation – Experimental methods of X-ray study- rotating crystal method – X-ray pattern by powder method – crystal structure of KCl, NaCl, ZnS, CsCl – Radius ratio and packing in crystal.

REFERENCES

1. B.R. Puri, L.R. Sharma, K.C. Kalia, *Principle of Inorganic Chemistry*, Vallabh Publications, 2004.
2. P.L. Soni, M. Katyal, *Text book of Inorganic Chemistry*, Sulan Chand ans Son, 1986.
3. Gurdeep Raj, *Advanced Inorganic Chemistry*, Goel Publishing house, 1986.
4. Satya Prakash, S. Modern, *Inorganic Chemistry*, S. Chand and Company Ltd., 2003.
5. Wahid U. Malik, G. D. Tuli, R.D. Madan, *Selected Topics in Inorganic Chemistry*, S. Chand and Company Ltd., 2001.
6. J.D. Lee, *Concise Inorganic Chemistry*, Blackwell Science, 5th Edn., 1996.
7. P.L. Soni, *Text book of Organic Chemistry*, Sulan Chand ans Son, 1986.
8. Arun Bhal, B.S. Bahl, *Advanced Organic Chemistry*, S. Chand and Company Ltd., 2003.

SBEC-II	B.Sc. Chemistry	2016-2017
M16UCHS02	INDUSTRIAL CHEMISTRY	
Credits: 2		

UNIT – I: Chemical Explosives

Preparation and chemistry of lead azide, nitroglycerine, nitrocellulose, TNT, RDX, Dynamite, cordite, picric acid, gunpowder, introduction to rocket propellants.

UNIT – II: Leather Industry

Curing, preservation and tanning of hides and skins, process of dehairing and dyeing. Treatment of tannery effluents.

UNIT – III: Agrochemical Industries

Important categories of insecticides, fungicides, herbicides, rodenticide, Mode of action and synthesis of common pesticides like gammexane, DDT, aldrin, Parathion, Malathion, Baygon.

UNIT – IV: Paints, Varnishes & Cleansing Agents

Paints & Varnishes: Primary constituents of paints, Dispersion medium (solvent), binder Pigments, formulation of paints and varnishes. Requirements of a good paint.

Cleansing Agents: Preparation of toilet and washing soaps, synthetic detergents-alkyl aryl sulphonates, ethanolamines, nonionic detergents, builders, additives, corrosion inhibitors.

UNIT – V: Cement and Glass

Cement: Manufacture – Wet Process and Dry process, types, analysis of major constituents, setting of cement, reinforced concrete. Cement industries in India.

Glass: Composition and manufacture of glass .Types of glasses- optical glass, coloured glasses and lead glass.

Reference:

1. B.N.Chakrabarty, Industrial Chemistry, Oxford & IBH Publishing Co, New Delhi, 1981.
2. B.K. Sharma, Industrial Chemistry, Goel Publishing House, Meerut.
3. P.P.Singh, T.M.Joesph, R.G.Dhavale, College Industrial Chemistry, Himalaya Publishing house, Bombay, 4th Ed., 1983.

SEMESTER - IV

Part	Course Title	Sub Code	Credits	Hr/ Week	Marks		Total
					IA	EA	
I	Tamil – IV	M16UFTA04	3	6	25	75	100
	Hindi – IV	M16UFHI04		6	25	75	100
II	English – IV	M16UFEN04	3	6	25	75	100
III	General Chemistry – IV	M16UCH04	5	4	25	75	100
	Allied – IV - Physics – II	M16UPHA02	4	4	25	75	100
	Practical – II - Inorganic Qualitative Analysis	M16UCHP02	5	3	40	60	100
	Allied Practical – II – Physics	M16UPHAP01	3	3	40	60	100
IV	SBEC – III – Food and Nutrition	M16UCHS02	2	2	25	75	100
IV	NMEC – II	M16UMAN03	2	2	25	75	100
			27				

MAJOR	B.Sc. Chemistry	2016-2017
M16UCH04	GENERAL CHEMISTRY- IV	
Credits: 5		

UNIT – I: Nitrogen and Oxygen group - Basic treatment

- Nitrogen group: Introduction; hydrides; nitrides, phosphides and arsenides; halides, oxo-halides, Oxides, oxo-acids and sulfides of N, P, As, Sb and Bi; Phosphazenes; Aqueous solution chemistry; Organic derivatives.
- Oxygen group: Introduction; Hydrides; Halides, Oxohalides, Oxides, Oxo-acids and their salts; Sulphur-nitrogen compounds; Aqueous solution chemistry of S, Se and Te; Organic derivatives.

UNIT – II: Halogens and Noble Gases- Basic Treatment

- Introduction: hydrogen halides-oxidation state, oxidizing power and reactivity-interhalogen compounds and polyhalogen ions-oxides and oxyfluorides of Cl, Br and I-oxo-acids of halogens and their salts-aqueous solution chemistry-organic derivatives.
- Noble gases: Introduction; compounds of Xe, Kr and Rn, structure and bonding in XeF₂, XeF₄, XeO₃, XeO₄.

UNIT III: Solutions

- Types of solutions, nature of solutions, formation of solutions-molecular solutions, ionic solutions, effect of temperature and pressure on solubility.
- Colligative properties: lowering of vapour pressure, elevation of boiling point, depression of freezing point and osmosis & osmotic pressure of solutions

UNIT IV: Stereochemistry

- Stereoisomers: Alkene Configurational Isomers, Cycloalkane Configurational Isomers
Conformational Isomers: Ethane, Butane, Cycloalkanes, Substituted Cyclohexanes
Chirality & Symmetry: Symmetry Elements, Enantiomorphism, Optical Activity, Configurational nomenclature, Compounds Having Two or More Stereogenic Centers, Fischer Projection Formulas, achiral diastereomers, Other Configurational Notations, Resolution, Conformational Enantiomorphism.

UNIT V: Reactions of Carbonyl Compounds

- Carbonyl compounds: introduction, general mechanism for nucleophilic acyl substitution.
- Relative reactivity of carbonyl compounds-Reactions of carbonyl compounds with carbon, hydrogen, nitrogen and oxygen nucleophiles like Grignard reagents, HCN, Lithium aluminium hydrides, sodium borohydride, addition of water, addition of primary & secondary amines, addition of alcohol- stereochemistry of nucleophilic addition(RE & SI face)- reactions of α , β unsaturated carbonyl compounds.

REFERENCES

1. B.R. Puri, L.R. Sharma, K.C. Kalia, *Principle of Inorganic Chemistry*, Vallabh Publications, 2004.
2. P.L. Soni, M. Katyal, *Text book of Inorganic Chemistry*, Sulan Chand ans Son, 1986.
3. Gurdeep Raj, *Advanced Inorganic Chemistry*, Goel Publishing house, 1986.
4. Satya Prakash, S. Modern, *Inorganic Chemistry*, S. Chand and Company Ltd., 2003.
5. Wahid U. Malik, G. D. Tuli, R.D. Madan, *Selected Topics in Inorganic Chemistry*, S. Chand and Company Ltd., 2001.
6. J.D. Lee, *Concise Inorganic Chemistry*, Blackwell Science, 5th Edn., 1996.
7. P.L. Soni, *Text book of Organic Chemistry*, Sulan Chand ans Son, 1986.
8. Arun Bhal, B.S. Bahl, *Advanced Organic Chemistry*, S. Chand and Company Ltd., 2003.

PRACTICAL-II	B.Sc. Chemistry	2016-2017
M16UCHP02	INORGANIC QUALITATIVE ANALYSIS	
Credits: 5		

1. Inorganic qualitative analysis: Analysis of a mixture containing two cations and two anions of which one will be an interfering ion. Semi-micro methods using the conventional scheme with hydrogen sulphide may be adopted.

Anions to be studied:

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

Cations to be studied:

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

REFERENCES

1. Douglas A, Skoog and Donal M. West Hort, *Fundamentals of analytical Chemistry*, Rinechan and Winston Inc., New York.
2. Venkateswaran.V, Veerasamy.R, and Kulandaivelu.R, *Basic Principles of Practical Chemistry*.
3. Walter E Harris and Brgron Kratochvil, *An introduction to Chemical Analysis*.

SBEC-III	B.Sc. Chemistry	2016-2017
M16UCHS03	FOOD AND NUTRITION	
Credits: 2		

UNIT-I: Food Adulteration

Sources of foods, types, advantages and disadvantages, constituents of foods, carbohydrate, protein, fats, oils, colours, flavours, natural toxicants.

UNIT-II: Food Poisoning

Sources, causes and remedy- Causes and remedies for acidity, gastritis, indigestion and constipation.

UNIT-III: Food Preservation and Processing

Food spoilage, courses of food spoilage, types of Food spoilage, food preservation, preservation and processing by heating- sterilisation, pasteurisation.

UNIT-IV: Vitamins

Sources, requirement deficiency diseases of A, C, K, E1 and B1, B2, B6.

UNIT-V: Minerals

Mineral elements in food-Principal mineral elements-source. Function-Deficiency and daily requirements-Na, K, Mg, Fe, S and P.

REFERENCES

1. Seema Yadav — *Food Chemistry*, Anmol publishing (P) Ltd, New Delhi.
2. Car H. Synder — *The Extraordinary Chemistry for ordinary things*, John Wiley & Sons Inc., New York,(1992).
3. B. Sivasankar - *Food Processing and Preservation*, PHI Learning (P) Ltd, New Delhi.

SEMESTER - V

Part	Course Title	Sub Code	Credits	Hr/ Week	Marks		Total
					IA	EA	
III	Inorganic Chemistry I	M16UCH05	5	4	25	75	100
	Organic Chemistry- I	M16UCH06	5	4	25	75	100
	Elective - I - Physical Chemistry - I	M16UCHE01	4	5	25	75	100
	Elective - I – Polymer Chemistry	M16UCHE02			25	75	100
	Elective - I – Material Science	M16UCHE03			25	75	100
	Elective - I – Chromatographic Techniques	M16UCHE04			25	75	100
	Elective – II – Analytical Chemistry	M16UCHE05	4	5	25	75	100
	Elective – II – Drug Discovery	M16UCHE06			25	75	100
	Elective – II – Diary Chemistry	M16UCHE07			25	75	100
	Elective – II – Medicinal Chemistry	M16UCHE08			25	75	100
	Practical – III - Physical Chemistry Experiments	M16UCHP03	-	3	-	-	-
	Practical – IV - Gravimetric and Organic Analysis	M16UCHP04	-	5	-	-	-
IV	SBEC - III – Pharmaceutical Chemistry	M16UCHS04	2	2	25	75	100
	SBEC - IV – Green Chemistry	M16UCHS05	2	2	25	75	100
			22				

MAJOR	B.Sc. Chemistry	2016-2017
M16UCH05	INORGANIC CHEMISTRY – I	
Credits: 5		

UNIT – I: Group Theory and Coordination Compounds - I

Symmetry elements and Symmetry operations – point groups of molecules: SiBrClF, H₂O₂, H₂O, POCl₃, CO, B₂H₆, PCl₅, H₂, SF₆. Introduction to coordination compounds; Double salts and coordination compounds; Werner's work; effective atomic number-coordination numbers and geometries in transition metal complexes; nomenclature; isomerism in transition metal complexes – structural, geometrical and optical isomerism of 4 and 6 coordination complexes.

UNIT – II: Coordination Compounds-II

Bonding in transition metal complexes – valence bond theory, crystal field theory (octahedral and tetrahedral complexes); magnetism.

UNIT – III: Transition Metals of the First Series

Introduction and the Chemistry of Scandium, Titanium, Vanadium, Chromium, Manganese, Iron, Cobalt, Nickel, Copper and Zinc.

UNIT – IV: Transition Metals of the Second Series:

Introduction and the chemistry of Yttrium & Lanthanum, Zirconium & Hafnium, Niobium & Tantalum, Molybdenum & Tungsten.

UNIT – V: Lanthanide and Actinide Elements

Lanthanides: Introduction, occurrence, separation, oxidation states and general chemistry including electronic structure, color and spectra, lanthanide contraction, magnetic properties and coordination complexes.

Actinides: Introduction, isolation and general chemistry including electronic structure, color and spectra, actinide contraction, magnetic properties and coordination complexes.

REFERENCES

1. Wahid U. Malik, G. D. Tuli, R.D. Madan, Selected Topics in Inorganic Chemistry, S. Chand and Company Ltd., 2001.
2. Satya Prakash, S. Modern, Inorganic Chemistry, S. Chand and Company Ltd., 2003.
3. B.R. Puri, L.R. Sharma, K.C. Kalia, Principle of Inorganic Chemistry, Vallabh Publications, 2004.
4. Gurdeep Raj, Advanced Inorganic Chemistry, Goel Publishing house, 1986.
5. P.L. Soni, Text book of Inorganic Chemistry, Sulan Chand and Son, 1986.

MAJOR	B.Sc. Chemistry	2016-2017
M16UCH06	ORGANIC CHEMISTRY-I	
Credits: 5		

UNIT I: Heterocyclic compounds and Nucleic acid

Chemistry of five and six-membered aromatic heterocycles with one hetero atom- aromaticity - synthesis and reactions of pyrrole, furan, thiophene, pyridine, indole, quinoline and isoquinoline.

DNA bases, Nucleosides and nucleotides, nucleic acids, helical forms of DNA, DNA replication.

UNIT II: Carbohydrates

Carbohydrates: Classification, configuration of aldoses and ketoses, reactions of monosaccharides like oxidation, reduction and osazone formation (phenyl hydrazone) stereochemistry of glucose, cyclic structure of mono saccharides, formation of glycosides, determination of ring size, di-saccharides and polysaccharides.

UNIT III: Amino acids and Proteins

Amino acids – Classification – methods of synthesis of amino acids – reactions of amino acids (with reference to glycine) – Action of heat on amino acids – Peptide linkage and polypeptide formation – Determination of structure of polypeptide – Partial hydrolysis method and terminal residue hydrolysis method. Proteins – classification – colour reactions – Properties of proteins – Primary, secondary and tertiary structure of proteins.

UNIT IV: Organometallic compounds and Organic sulphur compounds

Preparation and reactions of diethyl zinc and methyl lithium – preparation and uses of organotin compounds and mercury compounds – TEL.

Preparation and properties of thioalcohols and thioethers. Preparation and uses of sulphonal, mustard gas, sulphone and s-benzyl thiouronium salts.

UNIT V: Carboxylic acids

Structure of carboxylic acid and carboxylate anion – Relative strengths of monocarboxylic acids – effect of substituents on acidity – preparation, properties and synthesis of citric acid – Action of heat on alpha, beta and gamma hydroxy acids – Action of heat on dicarboxylic acid (Blanc's rule) – Preparation and uses of NBS.

Acids derivatives– nucleophilic acyl substitution (acid and base catalysed), Hell – Volhard – Zelinsky method – Arndt Eistert synthesis – Mechanism of esterification and ester hydrolysis (acidic and alkaline) – synthesis of ester by Tischenko reaction.

REFERENCES

1. Finar, I. L., Organic Chemistry, Volume 2. *Stereochemistry and chemistry of natural products*.
2. John Mann, *Chemical Aspects of Biosynthesis*, Oxford University Press, Oxford.
3. Bruice P. Y., *Organic Chemistry*, Pearson Education, 3rd edition, 2006.

ELECTIVE-I	B.Sc. Chemistry	2016-2017
M16UCHE01	PHYSICAL CHEMISTRY-I	
Credits: 4		

UNIT-I: catalysis

General characteristics of catalytic reactions, acid – base catalysis, enzyme catalysis, mechanism and kinetics of enzyme catalyzed reactions, Michaelis-Menten equation, effect of temperature on enzyme catalysis, Heterogeneous catalysis, pH dependence of rate constants of catalyzed reactions.

UNIT-II: Chemical Equilibrium and solubility

A dynamic equilibrium, the equilibrium constant, a kinetic argument, K_p , predicting the direction of reactions, Le Chatlier's principle, effect of T,P,V and catalyst.

Solubility product constant, simple calculations on solubility product, common ion effect, precipitation calculations, criterion for precipitation, completeness of precipitation, fractional precipitation, effect of pH on solubility.

UNIT-III: Chemical Kinetics-I

Rate of a reaction, order of a reaction, rate law and the mechanism, factors affecting reaction rates, molecularity, derivation of rate constant of a second order reaction-when the reactants are taken at different initial concentrations-when the reactants are taken at the same initial concentrations-Determination of the rate constant of a II order reaction-Derivation of rate constant of a third order reaction-when the reactants are taken at the same initial concentrations. Derivation of half-life periods for second and third order reactions having equal initial concentration of reactants.

Effect of temperature on reaction rates-Derivation of Arrhenius equation-concept of activation energy-determination of Arrhenius frequency factor and energy of activation.

UNIT-IV: Chemical Kinetics-II

Collision theory of reaction rates-Derivation of rate constant of a bimolecular reaction from collision theory-Failures of CT. Lindemann theory of Unimolecular reactions. Theory of Absolute Reaction Rates-Thermodynamic derivation of rate constant for a bimolecular reaction based on ARRT- comparison between ARRT and CT. Significance of free energy of activation and entropy of activation.

UNIT-V: Photochemistry

Consequences of light absorption- Jablonski diagram- non radiative transitions-radiative transitions-Grotthus-Draper law- The Stark Einstein law of photochemical equivalence-Quantum efficiency, quantum yield. Energy transfer in photochemical reactions-photosensitization-Photosynthesis in plants- Chemiluminescence - fluorescence and phosphorescence-lasers-uses of lasers. Photochemical reactions-Kinetics of hydrogen-bromine reaction-decomposition of HI.

REFERENCES

1. *General chemistry*- Robinson
2. *General chemistry*- Ebbing
3. Puri B.R., Sharma L.R., Pathania M.S., *Principles of Physical Chemistry*, (23rd edition) New Delhi, Shoban Lal, Nagin Chand & Co., (1993).
4. Atkins P.W., *Physical Chemistry*, (7th edition) Oxford University Press. (2009).
5. Castellan G.W., *Physical Chemistry*, New Delhi, Orient Longmann.

ELECTIVE-I	B.Sc. Chemistry	2016-2017
M16UCHE02	POLYMER CHEMISTRY	
Credits: 4		

UNIT-I

Basic concepts: An introduction to polymers and macro molecules. Natural and synthetic polymers. Classification of Polymers-addition and condensation polymers. General methods of preparation of polymers. Polymerization through functional groups, multiple bonds and ring opening. Coordination polymerization.

UNIT-II

Structure of polymers- linear, branched and cross linked Stereochemistry of polymers- Isotactic, Syndiotactic and Atactic - properties of polymers : The crystalline melting point. The glassy state and glass transition temperature.

UNIT-III

Copolymerisation – Definitions – homo and copolymers. Block copolymers and Graft copolymers. Molecular weight of polymers. Number average molecular weight and weight average molecular weight. Determination of molecular weight by Viscosity and Osmometry methods.

UNIT-IV

Poly olefins-polythene, PTFE, Freons, PVC, polypropylene and polystyrene. Natural and synthetic rubbers.-Constitution of natural rubber. Butyl, Buna, Buna-S, Buna-N, Neoprene, SBR, Thiocol, Polyurethane and silicone rubbers.

UNIT-V

Plastics and Resins Definitions. Thermoplastic and thermosetting resins. Constituents of plastic-fillers, dyes, pigments, plasticizers, Lubricants and catalysts. Uses of thermoplastic resins and thermo setting resins.

REFERENCES

1. V. R. Gowrikar, N.V. Viswanathan : *Polymer Science*, Wiley Eastern Limited, New Delhi. 1986
2. R.B. Seymour, *Introduction to Polymer Chemistry*, MC Craw Hill, New York 1971.
3. S.S. Dara, *A Text Book in Engineering Chemistry*, S.Chand & Company Ltd, New Delhi. Third Edition, 1992.

ELECTIVE-I	B.Sc. Chemistry	2016-2017
M16UCHE03	MATERIAL SCIENCE	
Credits: 4		

UNIT – I: Ionic Conductivity and Solid Electrolytes

Type of ionic crystals – Alkali halide – silver chloride – alkali earth fluoride – simple stoichiometric oxides. Types of ionic conductors – halide ion conductors – oxide ion conductors. Solid electrolytes – application of solid electrolytes. Electrochemical cell – principle – batteries, sensors and fuel cells. Crystal defects in solids – line and plane defect – point defects – Schottky and Frenkel defects. Electronic properties and band theory: metals, semiconductor – inorganic solids – colour, magnetic and optical properties, luminescence, lasers.

UNIT – II: Magnetic Materials

Introduction – types of magnetic materials – diamagnetism – paramagnetism, ferromagnetism. Ferrites: preparation and their application in microwave – floppy disc – magnetic bubble memory and applications. Insulating materials: classification – on the basis of temperature – polymer insulating materials and ceramic insulating materials Ferro electric materials; examples, application of ferroelectrics.

UNIT – III: Modern Engineering Materials

Metallic glasses – introduction – composition, properties and applications. Shape memory alloys: introduction – examples- application of SMA- advantages and disadvantages. Biomaterials: Introduction – metals and alloy in biomaterials- Ceramic biomaterial, composite biomaterials – polymer biomaterials.

UNIT – IV: Nanochemistry – I

Nanoscale, nanomaterials – definition. Types of nanomaterials – quantum wells, quantum wires, quantum dot. Different types of nano structures – nanoclusters, nanocrystals, nanowires and nanotubes, definition of nanotechnology, nanoscience and nanochemistry. Significance of the nanoscale. Factors responsible for the special properties of nanomaterials. Nanotechnology and health issues - risks from nanoparticles and nanosafety. Nanotechnology and environmental issues.

UNIT – V: Nano Chemistry – II

A few important methods of synthesis of nanomaterials – Laser Ablation, Sonication, phase – transfer methods and sol – gel method. Application of nanotechnology – medicine diagnostics, drug delivery, food and drinks, cosmetics, textiles, sports / outdoor, filtration chemical industry, catalysis, electronic, displays.

REFERENCE

- 1) Anthony R. West, *Solid state chemistry and its application*, John Wiley & Sons (1989).
- 2) Raghavan V.R., *Materials Science and Engineering*, Printice Hall (India) Ltd., (2001)
- 3) Kenneth J.Klabunde, *Nanoscale materials chemistry*, A. John wiley and Sons Inc. Publications.
- 4) V. K. Ahuwalia, M.Kidwar, *New trends in Green Chemistry*, IInd Edition, Anamaya Publisher, New Delhi.

ELECTIVE-I	B.Sc. Chemistry	2016-2017
M16UCHE04	CHROMATOGRAPHIC TECHNIQUES	
Credits: 4		

UNIT – I

Introduction: Chromatography, types – LSC, GSC, LLC, GLC, chromatography terms – partition, adsorption, adsorbent, adsorbate, stationary phase, mobile phase, effluent, sample, solute, solvent, retention time, retention volume. Classification of chromatography – partition, adsorption, Exclusion and ion- exchange chromatography. Column chromatography: Principle, columns, packing the column, adsorbents, solvents, detectors Method of separation. Applications of column chromatography

UNIT – II

Thin layer chromatography: Introduction, advantages of TLG over column and paper chromatography, Theory of TLC. Experimental technique: preparation of the chromatoplates, activation of chromatoplates. Choice of adsorbents, selection of solvent, sample application. Development of chromatogram, location of compounds on chromatogram, detection methods. Applications of TLC.

UNIT – III

Paper chromatography: Types of paper chromatography, theory of paper chromatography, R_f value, factors influencing R_f value. Experimental method ; choice of filter paper, choice of solvents, preparation of solution Application of sample to the paper, development of chromatogram, drying the chromatogram, quantitative estimations. Types of paper chromatography: ascending chromatography, descending chromatography, ascending – descending chromatography, radial chromatography Applications of paper chromatography

UNIT - IV

Ion – exchange chromatography: Introduction, ion- exchangers, properties of ion – exchangers. Cation exchange resins, action of cation exchanger- Anion exchange resins, action of anion exchanger. Theory of ion – exchange chromatography, experimental technique of ion – exchange chromatography. Applications of ion - exchange chromatography

UNIT – V

Gas chromatography: Introduction, types, Theory. Gas chromatograph: carrier gas, sample injection system, Columns, thermal compartments, detection system. Working technique, interpretation of gas chromatogram, factors affecting separation in gas chromatography. Applications of gas chromatography

REFERENCES

1. A. K. Srivasta and P. C Jain, *Instrumental Approach to Chemical Analysis*, S. Chand & Company Ltd, New Delhi, India.
2. R. Stock and C.B.F. Rice, *Chromatographic Method*, Chapman and Hall, London.H. Heftmann, *Chromatography*, 6th edn., Elsevier, the Netherlands.
3. Hames m.miller, *Chromatography: Concepts and Contrasts*, 2nd Edn., John Wiley & Sons, USA.

ELECTIVE-II	B.Sc. Chemistry	2016-2017
M16UCHE05	ANALYTICAL CHEMISTRY	
Credits: 4		

UNIT – I: Chromatography

Chromatography – classification – principles of adsorption - Column, thin layer, partition, paper and high pressure liquid (HPL), chromatography, absorbents - Preparation of column, elution, recovery of substance - Thin layer chromatography – choice of adsorbent and solvent preparation, R_f value - Ion exchange chromatography – principle, Resins – action of resins, experimental techniques, application.

UNIT – II: Thermoanalytical and Electroanalytical Methods

Thermogravimetric analysis (TGA) - principle, derivative thermogravimetric analysis, factors affecting TGA, application - Thermometric titrations, Differential thermal analysis – Simultaneous DTA, TGA curves - Electogravimetric analysis – theory, instrumentation, applications - Coulometric analysis, coulometric titrations, applications - Polarographic curves, application to qualitative and quantitative analysis - Amperometric titrations – principle and applications.

UNIT – III: Colorimetric and Spectrophotometric Analysis

Visible colorimetry – instrumentation – Spectrophotometry - Photoelectric – photometers - Fluorimetry – principle, instrumentation, applications - Flame photometry – principle instrumentation and applications - Nephelometry and turbidimetry – theory and instrumentation - Turbidimetric titrations and applications.

UNIT – IV: Water Analysis

Sampling and preservation of water samples – physical examination of water: colour, odour, turbidity, taste and electrical conductivity – chemical characterization: pH, acidity, alkalinity, TDS, total, temporary, permanent, degree of hardness, BOD, COD, DO, detergents and pesticides – residual chlorine and chlorine demand – bacteriological examination: total and faecal coliforms.

UNIT – V: Fuel Analysis

Solid fuels: coal – classification – proximate analysis: moisture content, ash content, volatile matter and fixed carbon – ultimate analysis: carbon, hydrogen, nitrogen, sulphur and oxygen – heating values – grading of coal – comparison of coal and coke – liquid fuels: flash point, aniline point, octane number and carbon residues – gaseous fuels: producer gas and water gas – calorific values.

REFERENCES

- 1) Douglas A. Skoog, F. James Holler, Timothy A. Nieman, *Principle of Instrumental Analysis*, 5th Edn., 2004.
- 2) H. H Willard L. L Merrit , J. A settle, *Instrumental Methods of Analysis*, CBS Publishers, 1986.
- 3) V. K. Srivastva and K. K. Srivatsava, *Introduction to Chromatography*.
- 4) A. K. Srivastava and P. C. Jain, *Chemical Analysis* S. Chand and Company Ltd., 1963
- 5) D. A. Skoog, D. M. West, F. J. Holler, *Fundamental of Analytical Chemistry*, Harcourt Asia, 2001.
- 6) G. D. Christian, *Analytical Chemistry WSE*, Wiley, 2003.
- 7) Sharma and Kaur, *Environmental Chemistry*, Krishna Publishers, New Delhi, 2000.
- 8) L. Winther, *Wastewater Engineering*, Polyteknisk Forlag, Lyngby, 1978
- 9) A.K. De, *Environmental Chemistry*, Wiley Eastern Ltd, New Delhi, 1989.

ELECTIVE-II	B.Sc. Chemistry	2016-2017
M16UCHE06	DRUG DISCOVERY	
Credits: 4		

UNIT-I

Introduction - Drug Discovery/Development -Drug Discovery - Drug Development - Source of Drugs - Structural effects on drug action - Approaches to New Drug Discovery.

UNIT-II

Drugs Derived from Natural Products - Existing Drugs as a Source for New Drug Discovery - Using Disease Models as Screens for New Drug Leads - Physiological Mechanisms: the Modern “Rational Approach” to Drug Design - Approaches to Lead Optimization.

UNIT-III

Bioisosteric replacement - Conformation restriction - Increase selectivity - Increase affinity - Pharmacophore - Molecular dissection - Metabolic stabilization - Enzymes as Targets of Drug Design - Enzyme kinetics - Enzyme inhibition and activation - Approaches to the Rational Design of Enzyme Inhibitors.

UNIT-IV

Receptors as Targets of Drug Design -Receptor Theory - Receptor Complexes and Allosteric Modulators - Second and Third Messenger Systems -Molecular Biology of Receptors - Receptor Models and Nomenclature - Receptor Binding Assays - Lead Compound Discovery of Receptor agonists and antagonists - Prodrug Design and Applications - Definition - Applications.

UNIT-V

Prodrug Design Considerations - Prodrug Forms of Various Functional Groups - Ester prodrugs of compounds containing –COOH or –OH - Prodrugs of compounds containing amides, imides, and other acidic NH - Prodrugs of Amines - Prodrugs for compounds containing carbonyl groups - Drug release and activation mechanisms - Simple one-step activation - Cascade release/activation systems - Prodrugs and intellectual property rights – two court cases

REFERENCES

1. Kerns, E.H.; Di, L. Drug-Like Properties: Concepts, *Structure Design and Methods: from ADME to Toxicity Optimization*, Academic Press, Oxford, 2008
2. BMC – *Burger's Medicinal Chemistry and Drug Discovery*, 6th Edition, Vol. 1. Principles and Practice, edited by M. E. Wolff, John Wiley & Sons: New York, 2003.
3. PMC – *Principles of Medicinal Chemistry*, 7th Edition, edited by T.L. Lemke, D. A. Williams, V. F. Roche, and S.W. Zito, Williams and Wilkins: Philadelphia, 2013.

ELECTIVE-II	B.Sc. Chemistry	2016-2017
M16UCHE07	DIARY CHEMISTRY	
Credits: 4		

UNIT-I

Milk: General composition of milk factors affecting the gross composition of milk, physico-Chemical change taking place in milk due to processing parameters-boiling pasteurization- sterilization and homogenization.

UNIT-II

Milk lipids-terminology and definitions Milk proteins: Physical properties of milk proteins-Electrical properties and hydration, solubility. Reaction of milk proteins with formaldehyde and ninhydrin. Milk carbohydrate-Lactose- Estimation of lactose in milk. Milk vitamins-water and soluble vitamins, effect of heat and light on vitamins. Ash and mineral matters in milk.

UNIT-III

Creams: Definition-composition-chemistry of creaming process- gravitational and centrifugal methods of separation of cream-Factors influencing cream separation (Mention the factors only)-Cream neutralization. Estimation of fat in cream. Butter : Definition-% composition-manufacture-Estimation of fat, acidity, salt and moisture content-Desi butter.

UNIT-IV

Milk powder: Definition-need for making powder-drying process- spraying, drum drying, jet drying and foam drying-principles involved in each. Manufacture of whole milk powder by spray drying process-keeping quality of milk powder. Ice cream : Definition-percentage composition-types- ingredients needed -manufacture of ice-cream stabilizers-emulsifiers and their role.

UNIT-V

Dairy Detergents: Definition-characteristics-classification-washing procedure (modern method) sterilization- chloramin-T and hypochlorite solution.

REFERENCES

1. *Outlines of Dairy Technology* - Sukumar De.
2. *Principles of Dairy Chemistry* - Robert Jenness and S. Patern.
3. *Indian Dairy products* - K.S. Rangappa and K.T. Achaya.

ELECTIVE-II	B.Sc. Chemistry	2016-2017
M16UCHE08	MEDICINAL CHEMISTRY	
Credits: 4		

UNIT-I

Common diseases – infective diseases – insect – borne, air – borne and water-borne – hereditary diseases – Terminology – drug, pharmacology, antimetabolites, absorption of drugs – factors affecting absorption –therapeutic index (Basic concepts only)

UNIT-II

Sources of drugs, pharmacologically active constituents in plants, Indian medicinal plants – tulsi, neem, keezhanelli – their importance – Classification of drugs – biological chemical (Structure not required) Drug receptors and biological responses – factors affecting metabolism of drugs. (Basic concepts only)

UNIT-III

Drugs based on physiological action, definition and two examples each of anesthetics-General and local – analgesics – narcotic and synthetic – Antipyretics and anti inflammatory agents – antibiotics – Penicillin, Streptomycin, Antivirals, AIDS – symptoms, prevention, treatment – Cancer (Structure not required)

UNIT-IV

Diabetes – Causes, hyper and hypoglycemic drugs – Blood pressure – Systolic & Diastolic Hypertensive drugs – Cardiovascular drugs – depressants and stimulants – Lipid profile – HDL, LDL cholesterol lipid lowering drugs. (Structure not required)

UNIT-V

Vitamins A,B, C, D, E and K micronutrients – Na, K, Ca, Cu, Zn and I, Medicinally important inorganic compounds of Al, P, As, Hg and Fe, Examples and applications, Agents for kidney function (Aminohippuric acid). Agents for liver function (Sulfo bromophthalein), antioxidants, treatment of ulcer and skin diseases. (Structure not required)

REFERENCES

1. S.Lakshmi Pharmaceutical Chemistry, S.Chand & Sons, New Delhi, 2004
2. V.K. Ahluwalia and Madhu Chopra, —Medicinal Chemistry||, Ane Books, New Delhi, 2008
3. P.Parimoo, — A Text Book of Medicinal Chemistry||, CBS publishers, New Delhi, 2006
4. Ashutosh Kar, —Medicinal Chemistry||, Wiley Eastern Ltd., New Delhi, 1993,
5. David William and Thomas Lemke, Foyes Principles of Medicinal Chemistry, BI Publishers.
6. Romas Nogrady, Medicinal Chemistry, Oxford Univ. Press.

SBEC-IV	B.Sc. Chemistry	2016-2017
M16UCHS04	PHARMACEUTICAL CHEMISTRY	
Credits: 2		

UNIT-I

Definition of the terms-drug, pharmacophore, pharmacodynamics, pharmacopoea, pharmacology, bacteria, virus, fungus, actinomycetes, metabolites, antimetabolites, LD50, ED50. Therapeutic index.

UNIT-II

Sulphonamides-mechanism and action of sulpha drugs- preparation and uses of sulphadiazine, sulphapyridine. Antibiotics-Definition-classification as broad and narrow spectrum, Antibiotics-penicillin, ampicillin, structure and mode of action only (no structural elucidation, preparation, assay)

UNIT-III

Analgesics-definition and actions-narcotic and non narcotic-morphine, Heroin. Antipyretic analgesics-salicylic acid derivatives-methyl salicylate, aspirin

UNIT –IV

Anaesthetics-definition-classification-local and general- volatile, nitrous oxide, ether, chloroform, uses and disadvantages – nonvolatile – intravenous - thiopental sodium, -local anaesthetics –cocaine and benzocaine. Antianaemic drugs-iron, vitamin B12 and folic acid-mode of action.

UNIT-V

Diabetics-Hypoglycemic agents-sulphonyl urea, biguanides. AIDS-causes, prevention and control. Indian medicinal plants and uses-tulasi , kilanelli, mango, semparuthi, adadodai and thoothuvalai.

REFERENCES

1. Singh.H and Kapoor.V.K, Vallabh Prakashan, *Organic Pharmaceutical Chemistry*.
2. Bentley and Drivers, *Pharmaceutical Chemistry*.
3. Allion Chidambaram, *Pharmaceutical Chemistry*.
4. Chatwal, *Organic Pharmaceutical Chemistry*.
5. Jayashree Ghosh .S, *Pharmaceutical Chemistry*.
6. Chatwal, *Inorganic Pharmaceutical Chemistry*.

SBEC-V	B.Sc. Chemistry	2016-2017
M16UCHS05	GREEN CHEMISTRY	
Credits: 2		

UNIT-I

Need for green chemistry – principles of green chemistry – atom economy – definition with example (ibuprofen synthesis) – green oxidant – hydrogen peroxide. Microwave assisted organic synthesis – apparatus required – examples of MAOS – advantages and disadvantages of MAOS. Organic reactions by Sonication method – apparatus required – examples of sonochemical reactions (Heck, Hunsdiecker and Wittig reactions).

UNIT-II

Green Reactions: Acetylation of primary amine, base catalyzed aldol condensation (synthesis of dibenzalpropanone), halogen addition to C=C bond (bromination of trans-stilbene), [4+2] cycloaddition reaction (Diels-Alder reaction between furan and maleic acid). Electrophilic aromatic substitution reactions (nitration of phenol, bromination of acetanilide) zeolite catalyzed Friedel-Crafts acylation.

UNIT-III

Green Solvents: Ionic liquids: simple preparation – types – properties and application – ionic liquids in organic reactions (Heck reaction, Suzuki reactions, epoxidation)- advantages and disadvantages. Diels-Alder reaction in water – catalysis in water (aerobic oxidation of alcohols catalyzed by Pd(II) / bathophenanthroline).

UNIT-IV

Basics of Nanochemistry: Definition, length scales and importance of nanoscale and its technology – self assembly of materials – self assembly of molecules – porous solids, nanowires, nanomachines and quantum dots. Nano particles: Introduction – types of nanoparticles – preparation, properties and uses of gold, silicon, silver, zinc oxide, iron oxide, alumina and titania nanoparticles.

UNIT-V

Synthesis and their characterization: Techniques to synthesize nanoparticles – top down and bottom up approaches – common growth methods. Electron microscopes – scanning electron microscopes (SEM) – transmission electron microscopes (TEM) – scanning probe microscopy – atomic force microscopy (AFM) – scanning tunneling electron microscope (STEM) – basic principles only.

REFERENCES

1. Green Chemistry: Environmental Friendly Alternatives, Rs. Sanghi and M.M.Srinivatava, Narosa Publishing House, New Delhi.
2. Green Chemistry, V.K. Ahluwalia, Narosa, New Delhi (2011).
3. Nanotechnology, S.Shanmugam, MJP Publishers, Chennai. (2010).
4. A Handbook on Nanochemistry, Patrick Salomon, Dominant Publishers and Distributers, New Delhi.
5. Nanobiotechnology, S. Balaji, MJP Publishers, Chennai. (2010).

6. Nano: The Essentials, T. Pradeep, Tata Mc-Graw Hill, New Delhi (2007).
7. Methods and Reagents for Green Chemistry, P. Tundo, A. Perosa and F. Zechini, John Wiley & Sons Inc., New Jersey, (2007).
8. The Chemistry of Nanomaterial: Synthesis, Properties and Applications, Vol. I and II, CNR Rao, Springer (2006).
9. Nanotechnology: Basic Science and Emerging Technologies, Mick Wilson, Kamali Kannangara, Geoff Smith, Michelle Simmons, Burkhard Raguse, Overseas Press (2005).
10. Nanochemistry, G. B. Segreev, Elsevier, Science, New York, (2006).

SEMESTER - VI

Part	Course Title	Sub Code	Credits	Hr/ Week	Marks		Total
					IA	EA	
III	Inorganic Chemistry – II	M16UCH07	5	5	25	75	100
	Organic Chemistry – II	M16UCH08	5	5	25	75	100
	Elective - III - Physical Chemistry - II	M16UCHE09	4	5	25	75	100
	Elective - III – Bio-Inorganic Chemistry	M16UCHE10			25	75	100
	Elective - III – Chemistry of Natural Products	M16UCHE11			25	75	100
	Elective-III–Conductors and Semiconductors	M16UCHE12			25	75	100
	Elective - IV – Spectroscopy	M16UCHE13			25	75	100
	Elective - IV – Corrosion Science	M16UCHE14	4	4	25	75	100
	Elective - IV - Forensic Chemistry	M16UCHE15			25	75	100
	Elective - IV – Catalysis	M16UCHE16			25	75	100
	Practical – III - Gravimetric and Organic Analysis	M16UCHP03			5	3	40
	Practical – IV - Physical Chemistry Experiments	M16UCHP04	5	6	40	60	100
IV	Value Added – Comprehensive Chemistry	M16UVA07	1	2	25	75	100
	Extension Activities	M16UEX01	1	-	-	-	-
			30				

MAJOR	B.Sc. Chemistry	2016-2017
M16UCH07	INORGANIC CHEMISTRY-II	
Credits: 5		

UNIT-I: Acids and Bases

Bronsted acids and bases: Bronstat acidity, periodic trends in Bronstat acidity, polyoxo compound formation; Lewis acids and bases: definitions, strengths, representative Lewis acids, heterogeneous acid-base reactions, solvent system concept, HSAB principle, theories of HSAB and super acids.

UNIT-II: Organometallic Chemistry 1

Compounds with transition metal to carbon bonds: classification of ligands, nomenclature, eighteen electron rule; transition metal carbonyls: range of compounds and structure, bonding, vibrational spectra, preparation, reactions; transition metal organometallics: square planar complexes, metal alkyls, metal alkylidenes, metal alkylidyne and cyclopentadienyl complexes; Structure and bonding: metal-olefin bond and arene metal bond.

UNIT-III: Organometallic Chemistry 2

Organometallic reactions and catalysis: oxidative addition, reductive elimination, insertion, hydride elimination, abstraction; olefin hydrogenation, hydroformylation, Wacker process, Ziegler-Natta polymerisation, cyclo oligomerisation, olefin isomerisation, olefin metathesis, Monsanto acetic acid synthesis, Fischer-Tropsch process, hydrosilylation.

UNIT-IV: Bio-inorganic Chemistry

Metal ion in biology and their vital role in the active site, Structure and functions of Metallo proteins and enzymes. Ion transport mechanism in cell membrane – Na and K pumps- Ionophores – Structures and characteristic features of Haemoglobin and myoglobin – VitaminB12

UNIT-V: Solid State-II

Metallic bond: Metallic properties, band theory of metals; semiconductors: n- and p-type semiconductors-superconductors. Imperfections in solids- Schotky defect, Frenkel defect, Metal excess defect, metal deficiency defect and line defects.

REFERENCES

1. Huheey, *Inorganic Chemistry*, 4th Edn., Harper International, 2001.
2. F. A. Cotton, G. Wilkinson, *Advanced Inorganic Chemistry*, 5th Edn., John Wiley.
3. D. F. Shriver, P. W. Atkins, C. H. Langford, *Inorganic Chemistry*, ELBS. 1990.
4. G. Sharpe, *Inorganic Chemistry*, 3rd Edn., Addison-Wesley, 1999.
5. J. D. Lee, *A New Concise Inorganic Chemistry*, 3rd Edn., ELBS, 1987.

MAJOR	B.Sc. Chemistry	2016-2017
M16UCH08	ORGANIC CHEMISTRY-II	
Credits: 5		

UNIT-I: Reactions at sp^3 hybridized carbon

Substitution reactions - S_N1 , S_N2 , S_Ni reaction mechanism with stereochemistry, factors influencing S_N1 and S_N2 reactions, neighbouring group participation. Nucleophilic aromatic substitution-addition-elimination, elimination-addition mechanism.

UNIT-II: Elimination Reactions

Elimination reaction E1, E2, E1cb reaction mechanisms, factors affecting, substitutions vs eliminations, Saytzev's and Hoffman rule.

UNIT-III: Molecular Rearrangement

Benzidine, Pinacol, Benzilic acid, Favorskii, Wolff, Hofmann, Curtius, Schmidt, Lossen, Beckman, Dienone phenol, Fries (Some idea of migratory aptitude), Demjanov, Baeyer-Villiger, Claisen, Cope and Wagner-Meerwein (only in brief).

UNIT-IV: Oxidation and Reduction

Oxidation: With Cr and Mn compounds; with peracids and other peroxides; with periodic acid, $Pb(OAc)_4$, $Hg(OAc)_2$ and SeO_2 . Reduction: Catalytic hydrogenation; metal hydride, dissolving metal and hydrazine based reductions. Cram-Felkin-Anh model.

UNIT-V: Alkynes and C-C bond formation

Alkynes - Acidity of alkynes - Addition of hydrogen - Hydroboration - Hydrohalogenation - Addition of hypohalous acid, Hydration - addition of water with $HgSO_4$ catalyst - Addition of alcohols and carboxylic acids - oxidation with $KMnO_4$ - Ozonolysis - formation of acetylides.

C-C Bond Formation: Mechanism of Acyloin, Aldol, Stobbe, Claisen, Knoevenagel and Benzoin condensations, Darzen's glycidic ester synthesis; Dieckmann reactions, Wittig reaction, Diels-Alder and ene reactions, Reformatsky reaction. Acetoacetic ester and malonic ester synthesis. Acylation reactions. Enamine reactions. Gattermann aldehyde synthesis. Michael and Mannich reactions.

REFERENCES

1. Organic Chemistry, P. Y. Bruice, Pearson Education, 3rd edition, 2006
2. Carruthers, W., Coldham, I. Some Modern Methods of Organic Synthesis, 2008.
3. March, J., Advanced Organic Chemistry, 4th ed, 1999.
4. Clayden, Greeves, Warren, and Wothers, Organic Chemistry, 1st ed, 2001.
5. R. Bruckner, Advanced Organic Chemistry, 2002
6. Finar I.L. *Organic Chemistry*, Vol I and II – ELBS.
7. Morrison and Boyd, *Organic Chemistry*, Allyn and Bacon Inc.

8. Solomons, T.W.G, *Organic Chemistry*, John Wiley.
9. Mehta O, Mehta PH, *Organic Chemistry*, Eastern Economy Edition.
10. Bhal. B.S, and Arun Bhal, *A Text book of Organic Chemistry*.
11. Soni.P.L., *Text Book of Organic Chemistry*, Sultan Chand and Sons.

ELECTIVE-III	B.Sc. Chemistry	2016-2017
M16UCHE09	PHYSICAL CHEMISTRY-II	
Credits: 4		

UNIT-I: Phase Rule

Definition of terms- Derivation of phase rule - One component systems-H₂O system, Sulphur system – explanation using Clausius - Clapeyron equation-supercooling and sublimation. Two component systems-solid liquid equilibria- reduced phase rule – simple eutectic systems-Ag-Pb only-Compound formation with congruent melting point-Mg-Zn system only. KI-H₂O system-efflorescence-deliqescence. C.S.T-phenol water system only. Effect of impurities on CST.

UNIT – II: Electro Chemistry-I

Electro chemistry: Metallic and electrolytic conductance – Definitions of specific, equivalent and molar conductances – Relations between them – measurement of conductance and cell constant. Variation of conductance with dilution – Qualitative explanation – Strong and weak electrolytes. Migrations of ions – transport number – determination by Hittorf and moving boundary methods – Kohlrausch’s law – applications – calculation of equivalent conductance for weak electrolytes and determination of transport number. Applications of conductance measurements – Oswalds dilution law, Degree of dissociation of weak electrolytes – Determination of Ionic product of water –conductometric titrations.

UNIT – III: Electro Chemistry-II

Theory of strong electrolytes – Debye – Huckel – Onsager theory – verification of Onsager equation – Wein and Debye – Falkenhagen effect. Activity and activity co-efficients of strong electrolytes – ionic strength. pH scale, Buffer solution – Henderson’s equations – uses of Buffers including living systems – common ion effect – solubility product principle – relation to solubility – Applications in qualitative and quantitative analysis.

UNIT – IV

Galvanic cells – Reversible and Irreversible cells – EMF and its measurement – Weston Standard cell – types of reversible single electrodes – standard Hydrogen electrode – calomel electrode – Derivation of Nernst equation both for emf of cells and single electrode potentials – Nernst theory for single electrode potential – standard reduction potentials – electro chemical series – significance. Application of emf measurements – Application of Gibbs – Helmholtz equation to galvanic cells – calculation of thermodynamic quantities – pH using hydrogen, quinhydrone and glass electrodes – potentiometric titrations.

UNIT - V

Concentration cells with and without transference – LJP expression – applications of concentrations cells – valency of ions – transport number – solubility product – activity coefficient. Storage cells – Lead storage battery – mechanism of charging and discharging fuel cells – hydrogen – oxygen cell – polarization – over voltage- decomposition voltage.

REFERENCE BOOKS

1. Puri B.R., Sharma L.R., Pathania M.S., Principles of Physical Chemistry, (23rd edition) New Delhi, Shoban Lal, Nagin Chand & Co., (1993)
2. Atkins P.W., Physical Chemistry, (7th edition) Oxford University Press. (2009).
3. Castellan G.W., Physical Chemistry, New Delhi, Orient Longmann.

ELECTIVE-III	B.Sc. Chemistry	2016-2017
M16UCHE10	BIO-INORGANIC CHEMISTRY	
Credits: 4		

UNIT-I: General Principles of Bioinorganic Chemistry

Occurrence, availability and functions of Inorganic elements in biological systems. Biomineralisation-Control and assembly of advanced materials in Biology - Nucleation and crystal growth –various biominerals – calcium phosphate – calcium carbonate – Amorphous silica, Iron- biominerals – strontium and barium sulphate.

UNIT-II: Function and Transport of Alkali and Alkaline Earth Metal Ions

Characterization of K^+ , Na^+ , Ca^{2+} and Mg^{2+} - complexes of alkali and alkaline earth metal ions with macrocycles - Ion channels – ion pumps. Catalysis and regulation of bioenergetic processes by the Alkaline Earth Metal ions Mg^{2+} and Ca^{2+} .

UNIT-III: Metals at the Center of Photosynthesis

Primary Processes in Photosynthesis – Photosystems I and II - Light Absorption (Energy Acquisition) – Exciton transport (Direct Energy Transfer) – Charge separation and electron transport – Manganese catalyzed oxidation of water to O_2 .

UNIT-IV: Cobalamines

Reactions of the alkyl cobalamins – One-electron Reduction and Oxidation – Co-C Bond Cleavage – coenzyme B12 – Alkylation reactions of methylcobalamin. Heme and Non-heme Proteins - Hemoglobin and Myoglobin – Oxygen transport and storage – Electron transfer and Oxygen activation. Cytochromes, Ferredoxins and Rubredoxins – Model systems, mononuclear non-hemiron enzymes.

UNIT-V Copper Containing Proteins

Classification and examples - Electron transfer – Oxygen transport - Oxygenation – oxidases and reductases – Cytochrome oxidase – Superoxide dismutase (Cu, Zn).

REFERENCES:

1. J. E. Huheey, Inorganic Chemistry, 3rd Ed., Harper & Row Publishers, Singapore.
2. Purcell and Kotz, Inorganic Chemistry, Saunders Golden Sunburst Series, W. B. Saunders Company, Philadelphia.
3. S. J. Lippard and J. M. Berg, Principles of Bioinorganic Chemistry, Panima Publishing Company, New Delhi, 1997.
4. W. Kaim and B. Schewederski, Bioinorganic Chemistry: Inorganic Elements in the Chemistry of Life, John Wiley & Sons, New York, USA.
5. Cotton and Wilkinson, Advanced Inorganic Chemistry, 5th ed., Wiley Interscience Publication, John Wiley & Sons, New York, USA.
6. Chem. Education, 62, No. 11, 1985, Bioinorganic Chemistry, State of the Art.
7. G. L. Eichorn, Inorganic Biochemistry, Volumes 1 & 2, 2nd ed., Elsevier Scientific Publishing Company, New York, 1973.
8. F. A. Cotton and G. Wilkinson, Inorganic Chemistry, John Wiley & Sons, New York.
9. R. H. Crabtree, The Organometallic Chemistry of the Transition Metals, John Wiley & Sons, New York.
10. S. E. Kegley and A. R. Pinhas, Problems and Solutions in Organometallic Chemistry, University Science Books, Oxford University Press.

ELECTIVE-III	B.Sc. Chemistry	2016-2017
M16UCHE11	CHEMISTRY OF NATURAL PRODUCTS	
Credits: 4		

Unit-I

Study of isolation, structure, stereochemistry, synthesis, biogenesis and biological properties of the following classes of natural products from plant, animal, and microbial sources.

Unit-II

Acetogenins and shikimates: Microbial metabolites: Pencillin G, Cephalosporins and streptomycin.

Unit-III

Terpenes-classification-isolation- isoprene rule-synthesis and structural elucidation of citral, geraniol, alpha pinene.

Unit-IV

Alkaloids -classification- isolation– general methods of determination of structure of alkaloids-synthesis and structural elucidation of piperine, atropine and nicotine.

Unit-V

Vitamins - classification- isolation – synthesis and structural elucidation - water and fat soluble vitamins.

REFERENCES

1. Finar, I. L., Organic Chemistry, Volume 2. *Stereochemistry and chemistry of natural products*.
2. John Mann, *Chemical Aspects of Biosynthesis*, Oxford University Press, Oxford.
3. Bruice P. Y., *Organic Chemistry*, Pearson Education, 3rd edition, 2006.

ELECTIVE-III	B.Sc. Chemistry	2016-2017
M16UCHE12	CONDUCTORS AND SEMICONDUCTORS	
Credits: 4		

Unit-I

Basics of Semiconductors: Crystal Structure, Energy Bands in solids, Classification of solids, classification of materials, Electron emission from solids, classification of semiconductors, properties of semiconductors, Hall effect, Diffusion, thermistors and photoconductors, Advantages of semiconductor devices.

Unit-II

Diodes and Transistors: Semiconductor junction diodes, diode circuits, junction transistors, characteristics, Biasing and amplification, Properties of CE, CB and CE amplifiers, high Frequency effects in transistors, noise in Transistors, Basic voltage and power amplifiers, feedback in amplifiers.

Unit-III

Field Effect transistors: Junction field effect transistors (JFET), static characteristics of JFET, pinch off voltage, Metal oxide Semiconductors FET (MOSFET), static characteristics of MOSFET, Biasing of FET, FET parameters

Unit-IV

Introduction to Digital Systems: Flip-Flop, Registers, Counters, K-map Intermodulation: λ Modulation and Demodulation.

Unit-V

IC and OP AMP: Fabrication of monolithic IC, integration of circuit components, Limitations of ICs, Advantages of IC's over analog circuits, Operational Amplifier (OP AMP), Basic operations of OP AMP, Applications of OP AMP.

REFERENCES

1. *Basic Electronics* by B. Basavaraj and H N Shivashanker.
2. *Physics of Semiconductor Devices* by S. M. Sze, John Wills & Sons Publications.
3. *Electronics: Analog and Digital* by I. J. Nagrath, PHI publications.
4. *Integrated Electronics*: J. Millman and C. C. Halkias, Tata McGraw Hills Publications
5. *Electronic Devices and Circuits* by Allen Mottershead, PHI publications.

ELECTIVE-IV	B.Sc. Chemistry	2016-2017
M16UCHE13	SPECTROSCOPY	
Credits: 4		

UNIT-I

Definition of spectrum. Electromagnetic radiation, quantization of different forms of energies in molecules (translational, rotational and electronic) Born Oppenheimer approximation. UV-VISIBLE Spectroscopy-Types of electronic transitions.pre- dissociation spectra and dissociation energy. Applications-Beer's- Lambert's law-O.D., chromophore, auxochrome, bathochromic and hypsochromic shifts-Instrumentation.

UNIT-II

I.R.Spectroscopy-principles-modes of vibration of diatomic, triatomic linear (CO₂) and non-linear triatomic molecules (H₂O)-stretching and bending vibrations-selection rules. Expression for vibrational frequency(derivation not needed) -instrumentation-sampling techniques. Applications.

UNIT-III

Raman spectroscopy-condition-Rayleigh and Raman scattering, stokes and antistokes lines. Differences between Raman and I.R.Spectroscopy. Mutual exclusion principle (CO₂ and N₂O). Microwave spectroscopy-theory of microwave spectroscopy, selection rule. Calculation of moment of inertia and bond length of diatomic molecules.

UNIT-IV

NMR Spectroscopy principle of nuclear magnetic resonance basic instrumentation-number of signals-chemical shift- shielding and deshielding-spin-spin coupling and coupling constants-TMS as NMR standard. Interpretation of NMR spectra of simple organic compounds such as Acetone, Anisole, Benzaldehyde, Ethyl acetate, Ethylamine, Ethyl Bromide, Toluene and Isopropyl phenyl ketone.

UNIT-V

Mass spectroscopy- Basic principles- instrumentation- molecular ion peak, base peak, metastable peak, isotopic peak- their uses. Nitrogen rule- ring rule- fragmentation. Interpretation of mass spectra of simple organic compounds such as Acetone, Anisole, Benzaldehyde, Ethyl acetate, Ethylamine, Ethyl Bromide, Toluene and Isopropyl phenyl ketone.

REFERENCES

1. R. M. Silverstein and F. X. Webster, *Spectrometric identification of organic compounds*, John Wiley and Sons.Inc., Sixth edition (1997).
2. W. Kemp, *Organic Spectroscopy*, Third Edition, MacMillon (1994).

3. Pavia, Lampman and Kriz, *Introduction to Spectroscopy*, 3rd Edn., Brooks/Cole Pubs. Co.
4. D. H Williams and Ian Fleming, *Spectroscopic methods in organic chemistry*, Tata McGraw Hill, (1998).
5. William Kemp, *Introduction to multinuclear NMR*.
6. Pine S. H, *Organic Chemistry*, (4th edition) New Delhi, McGraw- Hill International Book Company. (1986).
7. Kalsi. L., *Organic Spectroscopy*, New Delhi, New Age International Company. (1998).
8. Seyhan N. Ege, *Organic Chemistry*, New York, Houghton Mifflin Co., (2004).
9. YR Sharma, *Elements of Organic Spectroscopy*, S Chand Pub. (2010)

ELECTIVE-IV	B.Sc. Chemistry	2016-2017
M16UCHE14	CORROSION SCIENCE	
Credits: 4		

UNIT-I: Corrosion Principles

Introduction - Definition – Mechanism – Electrochemical Reactions – Polarization – Passivity – Effect of Oxygen and Oxidizers, Velocity, Temperature, Corrosion Concentration and Galvanic Coupling

UNIT-II: Types of Corrosion

Metal Corrosion – Types (Crevice Corrosion, Pitting, Intergranular Corrosion, Selective Leaching, Erosion Corrosion, Stress Corrosion) - Hydrogen Damage.

UNIT-III: Corrosion Testing- I

Introduction – Classification – Purpose – Materials and Specimens – Surface Preparation – Measuring and Weighing – Exposure Techniques – Duration – Interval Tests – Aeration – Cleaning Specimens after Exposure – Temperature – Standard Expression for Corrosion Rate – Test for Stainless Steels (Huey, Streicher) – Warren Test – NACE.

UNIT-IV: Corrosion Testing- II

Test Methods Slow – Stain – Rate Tests – Linear Polarization – AC Impedance – Small – Amplitude Cyclic Voltammetry – Paint Tests – Sea Water Test – Miscellaneous Tests of Metals.

UNIT-V: Corrosion Prevention

Metals and Alloys – Metal Purification – Alteration of Environment – Changing Mediums – Inhibitors – Design – Wall Thickness – Design Rules – Cathodic Protection – Anodic Protection – Comparison of Anodic and Cathodic Protection - Coatings – Metallic and Inorganic Coatings – Organic Coatings – Corrosion Control Standards.

REFERENCES

1. Mars G. Fontana, Corrosion Engineering, McGraw- Hill International Editions, 1987.
2. Herbert H. Uhlig, Corrosion Hand Book, John Wiley and Sons, New York 1974.
3. V.S. Sastri, Corrosion Inhibitors, Principle and Applications, John Wiley and Sons, Newyork 1998.
4. C.C. Nathan, Corrosion Inhibitors, National Association of Corrosion Engineers, Houston, 1994.

ELECTIVE-IV	B.Sc. Chemistry	2016-2017
M16UCHE15	FORENSIC CHEMISTRY	
Credits: 4		

Unit-I

Introduction (Readings, discussion, video examples) - Science vs. Law
Forensic science and popular culture.

Unit-II

Statistics (Reading, discussion, tutorials) - Accuracy & Precision - Reliability -
Quality control - Legal issues.

Unit-III

Spectroscopy (Wiki Assignments, weekly minitutorials & class discussions) -
Atomic Spectroscopy - Micro spectrophotometry - Electrophoresis - Microscopy -
Chromatography – Immunoassays.

Unit-IV

Analysis of Forensic Samples (Individual papers, case studies, weekly tutorials,
analysis of actual cases).

Unit-V

Drug Analysis - Combustion & Arson - Inks, Paints & Pigments
Polymers & Fibers.

REFERENCES

1. G. L. Eichorn, *Inorganic Biochemistry*, Volumes 1 & 2, 2nd ed., Elsevier Scientific Publishing Company, New York, 1973.
2. F. A. Cotton and G. Wilkinson, *Inorganic Chemistry*, John Wiley & Sons, New York.
3. R. H. Crabtree, *The Organometallic Chemistry of the Transition Metals*, John Wiley & Sons, New York.
4. *Forensic chemistry Hand book*, Lawrence Kobilinsky.

ELECTIVE-IV	B.Sc. Chemistry	2016-2017
M16UCHE16	CATALYSIS	
Credits: 4		

UNIT-I

Introduction and Basic concepts in green catalysis.

UNIT-II

Solid acids and bases as catalyst, Application of catalyst functionality concepts for control of reaction selectivity and kinetic models.

UNIT-III

Kinetics and reaction on surfaces, Application of functionality concepts for control of reaction selectivity and microkinetic models.

UNIT-IV

Steps in catalytic reaction (Adsorption, Kinetic models, interparticulate and intraparticle transport process.

UNIT-V

Selection and design and Preparation of catalysts. Textural Properties of solid catalysts. Characterization of catalysts. Zeolite catalysts , preparation, characterization and applications.

REFERENCES

1. *Micro kinetics of heterogeneous catalysis*, Dumesic, J. A. Rude and Aparicio.
2. *The Role of Diffusion in Catalysis*, C. N. Satterfield and T. K. Sherwood.
3. *Introduction to Surface Chemistry and Catalysis*, G. A. Somorjai.

PRACTICAL-III	B.Sc. Chemistry	2016-2017
M16UCHP03	GRAVIMETRIC ESTIMATIONS & ORGANIC ANALYSIS	
Credits: 5		

I. GRAVIMETRIC ESTIMATIONS

1. Estimation of Barium as Barium sulphate
2. Estimation of Barium as Barium chromate
3. Estimation of Lead as Lead chromate
4. Estimation of Calcium as Calcium oxalate monohydrate
5. Estimation of Sulphate as Barium sulphate
6. Estimation of Nickel as Nickel DMG

II. A. ORGANIC QUALITATIVE ANALYSIS

Analysis of organic compounds. Characterisation of organic compounds by their functional groups and confirmation by preparation of derivative.

The following functional groups may be studied.

Aldehydes, Ketones, carboxylic acids, aromatic primary amines, phenol, aromatic ester, amide, diamide, anilide, nitro compounds and monosaccharides.

B. ORGANIC PREPARATIONS

1. Preparations involving the following :
 - a) Oxidation of benzaldehyde.
 - b) Hydrolysis of Methyl salicylate or ethyl benzoate.
 - c) Nitration – p-nitroacetanilide and m-dinitrobenzene
 - d) Bromination – p- bromoacetanilide and tribromophenol
 - e) Benzoylation — -naphthylbenzoate
2. Determination of boiling point of liquids.

REFERENCES

1. Furniss. B.S, Hannaform. A.J, Rogers.V, Smith.P.W.G, and Tatchell.A.R, *Vogel's Text Books of Practical Organic Chemistry*.
2. Douglas A, Skoog and Donal M. West Hort, *Fundamentals of analytical Chemistry* Rinechan and Winston Inc., New York.
3. Janarthanam.P.B, *Physico – Chemical Techniques of Analysis Vol I & II* – Asian Publishing House Bombay.

PRACTICAL-IV	B.Sc. Chemistry	2016-2017
M16UCHP04	PHYSICAL CHEMISTRY EXPERIMENTS	
Credits: 5		

1. Kinetics

- a) Determination of rate constant – Acid catalysed hydrolysis of an ester (methyl acetate or ethyl acetate)
- b) Iodination of acetone zero order kinetics.
- c) Rate constant for the reaction between persulphate -KI

2. Molecular weight determination – Rast method.

3. Heterogenous Equilibrium

- a) Effect of impurity on CST of phenol – water system and determination of concentration of sodium chloride.
- b) Determination of transition temperature of hydrated salts: sodium thiosulfate, sodium acetate, strontium chloride.

4. Phase rule: Simple Eutectic system –Naphthalene-Biphenyl

5. Electrochemistry : Conductivity

- i) Determination of cell constant
 - ii) Equivalent conductance of strong electrolyte.
 - iii) Conductometric titration- acid base titration
6. **Potentiometry** – Potentiometric titration – acid-base titration.

REFERENCES

1. Venkateswaran.V, Veerasamy.R, and Kulandaivelu.R, *Basic Principles of Practical Chemistry*.
2. Gopalan.R, Subramaniam.P.S, and Rengarajan.K, *Elements of Analytical Chemistry* – Sultan Chand & Sons.
3. Janarthanam.P.B, *Physico – Chemical Techniques of Analysis Vol I & II* – Asian Publishing
4. Brgron Kratochvil-*An introduction to Chemical Analysis*.

ALLILED-III	B.Sc. Chemistry	2016-2017
M16UCHA01	ALLIED CHEMISTRY	
Credits: 2		

UNIT-I

Chemical Bonding: Molecular Orbital Theory- bonding, antibonding and nonbonding orbitals. M.O. diagrams of Hydrogen, Helium, Nitrogen, discussion of bond order and magnetic properties. Hydrides-classification and characteristics - preparation, properties and uses of Borazole, NaBH_4 and LiAlH_4 .

UNIT-II

Natural radioactivity-radioactive series including Neptunium series-Group displacement law. Nuclear Binding energy, mass defect-Calculations. Nuclear Fission and Nuclear Fusion-differences – Stellar energy. Applications of radioisotopes-C-14 dating, rock dating.

UNIT-III

Covalent Bond-Orbital Overlap-Hybridisation – Geometry of Organic molecules-Methane, Ethylene and Acetylene. Electron displacement Effects: Inductive, Resonance, Hyper conjugative & steric effects and their effect on the properties of compounds. Stereoisomerism: Symmetry-elements of symmetry- cause of optical activity, Tartaric acid. Racemisation. Resolution. Geometrical isomerism of Maleic and Fumaric acids.

UNIT-IV

Aromatic compounds-Aromaticity-Huckel's rule - Electrophilic substitution in Benzene-Mechanism of Nitration, Halogenation-Alkylation, Acylation. Isolation, preparation, properties and structure of Naphthalene Haworth's synthesis. Heterocyclic compounds - Preparation, properties and uses of Furan, Thiophene, Pyrrole.

UNIT-V

Solutions: Liquid in liquid type-Raoult's law for ideal solutions. positive and negative deviation from Raoult's law-Reasons and examples, Fractional distillation and Azeotropic distillation. Chromatography: principle and application of column, paper and thin layer chromatography.

REFERENCES

1. *Organic Chemistry*, P. Y. Bruice, Pearson Education, 3rd edition, 2006
2. *Organic Chemistry*, Wade
3. A. G. Sharpe, *Inorganic Chemistry*, 3rd Edition, Addison-Wesley, 1999.
4. J. D. Lee, *A New Concise Inorganic Chemistry*, 3rd Edition., ELBS, 1987.
5. D. F. Shriver, P. W. Atkins, C. H. Langford, *Inorganic Chemistry*, ELBS. 1990.
6. Puri B.R., Sharma L.R., Pathania M.S., *Principles of Physical Chemistry*, (23rd edition)New Delhi, Shoban Lal, Nagin Chand & Co., (1993).

ALLILED-IV	B.Sc. Chemistry	2016-2017
M16UCHA02	ALLIED CHEMISTRY	
Credits: 2		

UNIT-I: Co-Ordination Chemistry

Co-ordination chemistry - definition of terms - classification of ligands - Nomenclature-Chelation - Examples. Chelate effect- explanation. 1.β. Werner's theory-conductivity and precipitation studies. Sidgwick's theory - Effective Atomic Number concept. Pauling's theory-postulates-Application to octahedral, square planar and tetrahedral complexes. Pauling's theory and magnetic properties of complexes. Merits and demerits of Pauling's theory. Biological role of Haemoglobin and Chlorophyll (Elementary idea of structure and functions).

UNIT-II: Carbohydrates & Amino acids

Carbohydrates: Classification, preparation and properties of Glucose and Fructose-Properties of Starch, Cellulose and derivatives of Cellulose. Inter conversion of Glucose to Fructose and vice versa. Amino Acids - classification, preparation and properties of Glycine and Alanine.

UNIT-III: Pharmaceutical Chemistry

Chemotherapy: Preparation, uses and mode of action of sulpha drugs-prontosil, sulphadiazine and sulphafurazole. Uses of penicillin, chloramphenicol and streptomycin, Definition and one example each for-analgesics, antipyretics, tranquilizers, sedatives, hypnotics, local anaesthetics and general anaesthetics . Cause and treatment of diabetes, cancer and AIDS.

UNIT-IV: Photochemistry

Photochemistry: Grothius-Draper law and Stark-Einstien's law of photochemical equivalence. Quantum yield. Example for photochemical reactions- Hydrogen-Chlorine reaction (elementary idea only) Photosynthesis. Phosphorescence and Fluorescence. Phase Rule: Phase rule and the definition of terms in it. Application of phase rule to water system. Reduced phase rule and its application to a simple eutetic system (Pb-Ag) Freezing mixtures.

UNIT-V: Electro Chemistry

Electro Chemistry: Kohlrausch law - measurement of conductance, pH determination. Conductometric titrations. Galvanic cells-EMF-standard electrode potentials, reference electrodes. Corrosion: Methods of prevention.

REFERENCES

1. Soni.P.L, *Text Book of Inorganic Chemistry*, Sultan Chand & Sons.
2. Puri and Sharma, *Text book of Inorganic Chemistry*, Vishal publishing
3. Soni.P.L., *Text Book of Organic Chemistry*, Sultan Chand and Sons.
4. Jain.M.K, *Principles of Organic Chemistry*, Vishal publishing Co.
5. Kundu and Jain, *Physical Chemistry*, S. Chand.
6. Puri, Sharma and Pathania, *Text-book of Physical Chemistry*, Vishal Publishing Co.

ALLIED PRACTICAL-II	B.Sc. Chemistry	2016-2017
M16UCHAP01	ALLIED CHEMISTRY	
Credits: 3		

I. TITRIMETRY

- a) Estimation of Sodium hydroxide - Standard sodium carbonate.
- b) Estimation of Hydrochloric acid - Standard Oxalic acid.
- c) Estimation of Ferrous sulphate – Standard Mohr’s Salt.
- d) Estimation of Oxalic Acid – Standard Ferrous Sulphate.
- e) Estimation of Ferrous iron using diphenylamine as internal indicator.

II. Organic Analysis :

- a) Detection of elements- nitrogen, sulphur and halogens.
- b) Detection of aliphatic or aromatic.
- c) Detection of whether saturated or unsaturated compounds.
- d) Preliminary tests and detection of functional groups, phenols, aromatic amines, aromatic acids, Urea, benzamide & carbohydrate.

REFERENCES

1. Furniss. B.S, Hannaford. A.J, Rogers.V, Smith.P.W.G, and Tatchell.A.R, *Vogel’s Text Books of Practical Organic Chemistry*.
2. Bassett.J, Denney.R.C, Jaffery.G.H and Mendham.J, *Vogel’s Hand Book of Quantitative Inorganic Analysis* ELBS – Longman.
3. Venkateswaran.V, Veerasamy.R, and Kulandaivelu.R, *Basic Principles of Practical Chemistry*.

NMEC-I	B.Sc. Chemistry	2016-2017
M16UCHN01	FORENSIC CHEMISTRY	
Credits: 4		

Unit-I

Introduction (Readings, discussion, video examples) - Science versus Law
Forensic science and popular culture.

Unit-II

Statistics (Reading, discussion, tutorials) - Accuracy & Precision - Reliability -
Quality control - Legal issues.

Unit-III

Spectroscopy (Wiki Assignments, weekly minitutorials & class discussions) -
Atomic Spectroscopy - Micro spectrophotometry - Electrophoresis - Microscopy -
Chromatography – Immunoassays.

Unit-IV

Analysis of Forensic Samples (Individual papers, case studies, weekly tutorials,
analysis of actual cases).

Unit-V

Drug Analysis - Combustion & Arson - Inks, Paints & Pigments
Polymers & Fibers.

REFERENCES

1. G. L. Eichorn, *Inorganic Biochemistry*, Volumes 1 & 2, 2nd ed., Elsevier Scientific Publishing Company, New York, 1973.
2. F. A. Cotton and G. Wilkinson, *Inorganic Chemistry*, John Wiley & Sons, New York.
3. R. H. Crabtree, *The Organometallic Chemistry of the Transition Metals*, John Wiley & Sons, New York.
4. *Forensic chemistry Hand book*, Lawrence Kobilinsky.

NMEC-I	B.Sc. Chemistry	2016-2017
M16UCHN02	FOOD CHEMISTRY & TECHNOLOGY	
Credits: 4		

Unit I

General principle, plant design – design, construction, functionality of building, design & fabrication of equipments. Plant layout Pest proofing/ fumigation methods. Water supply to processing units.

Unit II

Production of Industrial Important Products- Ergot alkaloids, Probiotics, Production of recombinant vaccines. Anticancer agents and anti-inflammatory agents in chemotherapy. Biochips, Biofilms, Biosurfactants, Biorepellents.

Unit III

Separation Techniques- Chromatography – classification – Column, thin layer, partition, paper and high pressure liquid (HPLC), Thin layer chromatography – choice of adsorbent and solvent preparation, R_f value. Ion exchange chromatography – principle, Resins – action of resins, experimental techniques, application.

Unit IV

Spectroscopy- UV spectroscopy - Instrumentation - application, IR spectroscopy – Instrumentation - application, NMR spectroscopy - Instrumentation – application.

Unit V

Membrane separation technique: Principles, mechanisms, application & advantages of membrane separation processes. Concept of osmosis and reverse osmosis, different types of membrane modules and membrane material for R.O., Advantages and commercial applications of R.O.

Reference Books:

1. “Natural Extracts using supercritical carbon dioxide” M. Mukhopadhyay “Membrane separation Processes” by Kaushik Nath, PHI pvt. Ltd., 2008
2. “Introduction to process Engineering & Design” by S.B. Thakore & B.I Bhatt, Tata McGraw-Hill Ltd.,2007
3. Pharmaceutical Biotechnology – S.S. Purohit, Kaknani, Saleja
4. A concise Text Book of Pharmacology. N.Murugesh. Sixth edition. Sathya Publishers, Madurai.
5. A Text Book of Biotechnology. R.C. Dubey. S.Chand& Co Ltd, New Delhi.
6. H. H Willard L. L Merrit , J. A settle, *Instrumental Methods of Analysis*, CBS Publishers, 1986.

7. V. K. Srivastva and K. K. Srivatsava, *Introduction to Chromatography*.
8. A. K. Srivastava and P. C. Jain, *Chemical Analysis* S. Chand and Company Ltd., 1963.