

**MANONMANIAM SUNDARANAR UNIVERSITY  
TIRUNELVELI**

**UG COURSES – AFFILIATED COLLEGES**

**B.Sc. Chemistry**

**(Choice Based Credit System)**

**(with effect from the academic year 2016-2017 onwards)**

**(44<sup>th</sup> SCAA meeting held on 30.05.2016)**

Sem.	Pt. I/II/ III/ IV/ V	Sub No.	Subject status	Subject Title	Hrs./ week	Cre- dits	Marks				
							Maximum			Passing minimum	
							Int.	Ext.	Tot.	Ext.	Tot.
III	I	17	Language	Tamil/Other Language	6	3	25	75	100	30	40
	II	18	Language	English	6	3	25	75	100	30	40
	III	19	Core - 5	ORGANIC CHEMISTRY- II	4	5	25	75	100	30	40
		20	Major Practical – III	INORGANIC QUANTITATIVE ANALYSIS	3	-	50	50	100	20	40
		21	Allied -III	ALLIED CHEMISTRY- I	4	3	25	75	100	30	40
		22	Allied Practical-III	QUANTITATIVE ANALYSIS	2	-	50	50	100	20	40
	IV	23	Skilled Based subject-I	(A)AGROCHEMISTRY (OR) (B) FOOD CHEMISTRY	3	3	25	75	100	30	40
	IV	24	Non-Major Elective-I	(A) FOOD CHEMISTRY (OR) (B) WATER MANAGEMENT	2	2	25	75	100	30	40
Subtotal					30	19					

Sem.	Pt. I/II/III/IV/V	Sub. No.	Subject status	Subject Title	Hrs. / week	Credits	Marks				
							Maximum			Passing minimum	
							Int.	Ext.	Tot.	Ext.	Tot.
IV	I	25	Language	Tamil/Other Language	6	3	25	75	100	30	40
	II	26	Language	English	6	3	25	75	100	30	40
	III	27	Core - 6	PHYSICAL CHEMISTRY -II	4	5	25	75	100	30	40
		28	Major Practical-IV	INORGANIC QUANTITATIVE ANALYSIS	3	3	50	50	100	20	40
		29	Allied -IV	ALLIED CHEMISTRY – II	4	3	25	75	100	30	40
		30	Allied Practical-IV	QUANTITATIVE ANALYSIS	2	2	50	50	100	20	40
	IV	31	Skill Based Subject -II	(A)CHEMISTRY IN MEDICINE (OR) (B ) INDUSTRIAL CHEMISTRY	3	3	25	75	100	30	40
	IV	32	Non-Major Elective-II	(A) DAIRY CHEMISTRY (OR) (C) APPLIED CHEMISTRY	2	2	25	75	100	30	40
	V		Extension Activity	NCC,NSS, YRC, YWF		1					
Subtotal					30	25					

## **ORGANIC CHEMISTRY- II**

### **UNIT - I ALDEHYDES AND KETONES**

Structure and reactivity of carbonyl group – relative reactivities of aldehydes and ketones – mechanism of nucleophilic addition reaction (HCN, NaHSO<sub>3</sub>, Grignard reagent) – mechanism of aldol condensation, crossed aldol condensation, Knoevenagal reaction, Reformatsky reaction. Study of the following reactions – Wolff-Kishner reduction, Wittig reaction, Meerwein Ponndorf Verley reduction. Preparation, properties and uses of chloral, acrolein, crotonaldehyde and succinaldehyde.

### **UNIT-II CARBOXYLIC ACIDS & ACID DERIVATIVES**

Structure of carboxylic acid and carboxylate anion – relative strengths of monocarboxylic acids – effect of substituents on acidity – Hell – Volhard – Zelinsky reaction- action of heat on hydroxy acids- preparation, properties and uses of lactic acid and citric acid–dicarboxylic acids: action of heat on dicarboxylic acids - preparation, properties and uses of oxalic acid and succinic acid  
Acid anhydrides – Amides –Preparation, properties and structure of urea –Esters- mechanism of esterification and ester hydrolysis.

### **UNIT-III ORGANOMETALLIC COMPOUNDS AND ORGANO SULPHUR COMPOUNDS**

Preparation, structure and synthetic uses of Grignard reagent-preparation and reactions of methyl lithium, diethyl zinc and tetraethyl lead-Reformatsky reaction Preparation and properties of thioalcohols and thioethers – sulphonal-mustard gas and sulphones

### **UNIT –IV REACTIVE METHYLENE COMPOUNDS & TAUTOMERISM**

Reactivity of methylene groups – preparation and synthetic uses of diethyl malonate and ethyl acetoacetate. Tautomerism – definition – various types, keto – enol, amido – imido, nitro – acinitro and oxime – nitrosotautomerism.

## **UNIT-V ALICYCLIC COMPOUNDS**

Nomenclature -general methods of preparation – spectroscopic properties – chemical properties – relative stabilities of cyclo alkanes – Baeyer’s strain theory –Sachse-Mohr theory – Coulson and Moffit’s concept – conformations of cyclohexane and monosubstitutedcyclohexanes - largering compounds – synthesis and structure of civetone and muscone (structure elucidation not necessary).

### **Reference Books**

1. K.S. Tewari, N.K. Vishil, S.N. Mehotra – A text book of org. chem – 1st edition, Vikas Publishing House Pvt Ltd., 2001, New Delhi.
2. P.L. Soni, Text Book of Organic chemistry, Sultans chand, 1991, New Delhi,
3. Bahl and ArunBahl, Organic Chemistry, S. Chand and Sons, New Delhi, 2005.
4. M.K. Jain and S. C. Sharma, Modern Organic Chemistry
- 5.Organic Chemistry - R.T.Morrison and Boyd - Prentice Hall
- 6.Advanced General Organic Chemistry - SachinK.Ghosh - Books and Allied (P) Ltd
7. Organic Chemistry – Bhupinder Mehta and Manju Mehta - PHI Learning Pvt Ltd.

**Major Practical -III**

**INORGANIC QUANTITATIVE ANALYSIS**

**Objectives**

- ❖ To enable the students to understand various procedures in salt analysis.
- ❖ To create an awareness on ecofriendly approach in salt analysis

Qualitative analysis of inorganic salt mixtures containing two acidic radicals (one should be an interfering radical) and two basic radicals

1. Acidic radicals

Simple acidic radicals:

Carbonate, Nitrate, Sulphate, Chloride and Bromide.

Interfering acidic radicals:

Borate, Fluoride, Oxalate and Phosphate.

2. Basic radicals

Group I : Lead

Group II : Copper, Cadmium, Bismuth.

Group III : Ferric iron

Group IV : Cobalt, Nickel, Manganese, Zinc.

Group V : Barium, Strontium, Calcium

Group VI : Magnesium, Ammonium.

Internal – 25 marks

05 marks - Regularity

20 marks – Average of best eight salt mixtures in regular class work

External -75 marks

15 marks – Record (atleast 8 salt mixtures)\*

60 marks – Analysis (15 marks for each radical)

\*Experiments done in the class alone should be recorded

(Students having a bonafide record only should be permitted to appear for the practical examination)

**Reference books:**

1. V.V. Ramanujam, Inorganic Semi Micro Qualitative Analysis, 3rd edition, The National Publishing Company, Chennai, 1974.

3. Vogel's Text Book of Inorganic Qualitative Analysis, 4th edition, ELBS, London, 1974

**ALLIED CHEMISTRY - I**

**Objective**

To learn about atomic structure and bonding.

To learn the principles of reactions of organic compounds.

To study about photochemical reactions.

To learn about the importance of polymers and polymer science.

To study about lubricants and some cosmetics in the modern world.

**Unit I – Inorganic chemistry**

Atomic structure : electronic configuration - Aufbau principle - Pauli's exclusion principle- Hund's rule. Bonding : electrovalent, covalent, hydrogen bonds-orbital overlap - s-s, s-p. Hybridization and VESPR theory - CH<sub>4</sub>, C<sub>2</sub>H<sub>4</sub>, C<sub>2</sub>H<sub>2</sub>- BeCl<sub>2</sub>, BF<sub>3</sub>, NH<sub>3</sub>, H<sub>2</sub>O, PCl<sub>5</sub>, IF<sub>5</sub>, IF<sub>7</sub>.

**Unit II - Organic chemistry – Principles of reactions**

Heterolytic and homolytic cleavage - nucleophiles and electrophiles-reaction intermediates – preparation and properties of carbonium ions, carbanions and free radicals -type of reactions - substitution, addition, elimination and polymerisation reactions.

**Unit III-Physical chemistry - Photochemistry**

Definition-comparison between thermal and photochemical reactions-Laws of photochemistry-Beer Lambert's law-Grothus Draper law-Einstein's law-Quantum yield-low and high quantum yield-determination of quantum yield-fluorescence, phosphorescence, thermoluminescence, chemiluminescence and bioluminescence-definition with examples-photosensitisation.

**Unit IV-Polymer Chemistry**

Definition- Monomers, Oligomers and Polymers - Classification of polymers- natural, synthetic- linear, cross linked and network- plastics, elastomers, fibres- homopolymers and copolymers.Thermoplastics: polyethylene, polypropylene, polystyrene, polyacrylonitrile, poly vinyl chloride, nylon and polyester - Thermosetting Plastics : phenol formaldehyde and epoxide resin-Elastomers: natural rubber and synthetic rubber - Buna - N, Buna-S and neoprene.

### **Unit V-Applied Chemistry**

Lubricants-classification-criteria of good lubricating oils-synthetic lubricating oils-poly glycols and poly alkene oxides-greases or semi solid lubricants-examples-solid lubricants-graphite

Preparation and uses of shampoo, nail polish, sun screens, tooth powder, tooth paste, boot polish, moth ball and chalk piece.

### **Reference Books**

1. B. R. Puri, L. R. Sharma and K. C. Kalia, Principles of Inorganic Chemistry
2. P. L. Soni, Text Book of Inorganic Chemistry
3. K. S. Tewari and N. K. Vishnoi, A Text Book of Organic Chemistry.
4. Arun Bahl and B.S. Bahl, Advanced Organic Chemistry, S. Chand and Sons.
5. M.K. Jain and S. C. Sharma, Modern Organic Chemistry
6. K.K.Rohatgi Mukherjee, Fundamentals of photochemistry , Wiley Eastern Ltd.
7. B.R. Puri and L.R. Sharma, Principles of Physical Chemistry, Chand & Co.
8. Malcom P. Stevens, Polymer Chemistry – An Introduction
9. V.R. Gowariker, Polymer Science, Wiley Eastern, 1995.
10. Sawyer.W, Experimental cosmetics, Dover publishers, New york, 2000.

**Allied Practical - IV**

**Quantitative Analysis**

**Objective:**

To enable the students to acquire the quantitative skills in volumetric analysis.  
Acidimetry and alkalimetry

1. Estimation of oxalic acid – Std. oxalic acid
2. Estimation of  $\text{Na}_2\text{CO}_3$  – Std.  $\text{Na}_2\text{CO}_3$
3. Estimation of hydrochloric acid – Std. oxalic acid

Permanganometry

4. Estimation of ferrous ammonium sulphate – Std. ferrous ammonium sulphate
5. Estimation of oxalic acid – Std. oxalic acid
6. Estimation of ferrous sulphate – Std. oxalic acid
7. Iodometry
8. Estimation of  $\text{K}_2\text{Cr}_2\text{O}_7$  – Std.  $\text{K}_2\text{Cr}_2\text{O}_7$

Dichrometry

9. Estimation of ferrous iron – Std. ferrous ammonium sulphate

Complexometry

10. Estimation of Zn – Std.  $\text{ZnSO}_4$
11. Estimation of Mg – Std.  $\text{ZnSO}_4$

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**Note:**

Internal – 25 marks

5 marks - Regularity

20 marks – Average of best eight estimations in regular class work

External -75 marks

15 marks – Record (atleast 8 volumetric estimations)\*

10 marks – Procedure

50 marks – Result

\*Experiments done in the class alone should be recorded

(Students having bonafide record only should be permitted to appear for the practical examination)



**Skilled Based –I (A)**

**AGROCHEMISTRY**

**UNIT – I**

Fertilizers : Classification, macronutrients -role of nitrogen, potassium and phosphorus on plant growth – manufacture of urea, muriate potash and triple superphosphate. Complex fertilizers, mixed fertilizers & biofertilizers – their composition. Micronutrients – their role in plants.

Manures : Bulky organic manures – Farm yard manure - oil cakes - blood meal – fish manures - Composting process – handling and storage

**UNIT – II**

Pesticides : Definition - Classification of Pesticides based on the use and chemical composition – examples - general methods of application – Benefits of pesticides - Potential hazards. Safety measures -first aid.

Insecticides : Plant products – Nicotine, pyrethrin – Inorganic pesticides – borates. Organic pesticides – D.D.T. and BHC.

Fungicide : Sulphur compounds, Copper compounds, Bordeaux mixture.

Herbicides : Acaricides – Rodenticides. Attractants – Repellants.

**UNIT –III**

Soil: Origin of soil - definition of soil - rock system - weathering of rocks and minerals- main components of soil - organic, inorganic constituents - soil formation - factors favouring soil formation.

**UNIT –IV**

Characteristics of soil: Physical aspects - soil texture - pore space - bulk density, particle density - soil colour - surface area - soil colloids - plasticity, shrinkage - flocculation and deflocculation, soil air, soil temperature and their importance in plant growth.

Acid, alkaline and saline soils – diagnosis - Methods of reclamation and after care.

**Skilled Based –I (A)**

**UNIT –V**

Soil testing: concept and objectives – soil sampling , tools, collection, processing, dispatch of soil sample.

Estimation of total organic compound, available nitrogen and phosphorus in the soil sample.

Determination of pH, EC, moisture content, bulk density and particle density of the soil sample.

**Reference books:**

1. A text book of Soil Science – Daji.A, Asia Publishing House, Madras 1970.
2. Textbook of soil Chemical Analysis – Hesse,P.R.A John Murray Newyork,1971
3. Textbook of Soil Science - Biswas,T.D and Mukherjee,S.K.Second edition, Tata McGraw-Hill Education
4. Chemistry for Agriculture and Ecology-Y.Mido M.Satake, Discovery Publishing House.
5. Soil Fertility & Fertilisers – Samuel L.Tisdale, Werner L.Nelson, James D.Beaton, John L. Havlin. Fifth edition, Macmillan
6. Nature and properties of soils-Harry, O Buckman N Yle C. Brandy, Macmillan
7. Insecticides, Pesticides and Agro based Industries – R.C.Paliwal, K.Goel, R.K.Gupta, Small Business Publications

**Skilled Based –I (B)**

**FOOD CHEMISTRY**

**Objectives:**

To acquire the basic knowledge of food chemistry

**UNIT - I CONSTITUTION OF FOOD**

Food - definition - classification of food - energy requirements of individuals - source, classification and function of carbohydrates, proteins, lipids, vitamins and minerals - calorific values of food - rice, wheat, milk, fish, vegetables, fruits and cereals.

**UNIT - II FOOD ADDITIVES AND PRESERVATIVES**

Food additives: Definition - permitted food additives, characteristics and their role: antioxidants, stabilizers, flavours, sweeteners, emulsifiers, thickeners, food colourants.

Preservatives: Definition – methods of food preservation - heat, cold, deep-freezing, radiation.

**UNIT - III FOOD ADULTERATIONS**

Definition - adulterant, adulteration - types of adulterants - common adulterants and their determination in milk, oils, ghee, honey, chilly powder, coriander powder, turmeric powder, coffee powder, tea dust, asafoetida - food poisoning and its prevention – Prevention of Food Adulteration Act- food laboratories and their functions.

**UNIT - IV QUALITY STANDARDS**

Quality control - specification and standards - FA, FDA, WHO standards - ISI specifications, packing and labeling of foods - Essential Commodities Act, Consumer Protection Act - AGMARK.

**UNIT - V LABORATORY WORK**

1. Determination of fat, protein and carbohydrate in food stuff.
2. Analysis of fats and oils - iodine value, acid value and RM value.
3. Estimation of glucose by Bertranel method
4. Analysis of starch in foods
5. Isolation of casein from milk

**Reference books:**

1. Sivasankar B, Food Processing and Preservation, Prentice Hall of India Pvt. Ltd, New Delhi, 2002.
2. Swaminathan M. Textbook on Food Chemistry, Printing and Publishing Co, Ltd, Bangalore 1993.
3. N. S. Gnanaprakasam, G. Ramamurthy, Organic Chemistry, Lab Manual, S. Viswanathan Printers and Publishers Ltd.
4. Food Science – III Edition – B. Sri Lakshmi, New Age International Publisher, 2005.
5. Fundamentals of Foods and Nutrition – Mudambi. R. Sumathi, and Rajagopal, M.V. Willey Eastern Ltd, Madras.

**Non Major Elective –I (A)**

**FOOD CHEMISTRY**

**Objectives:**

To acquire the basic knowledge of food chemistry

**UNIT – I INTRODUCTION**

Food : sources and classification – food as a source of energy - functions and biological importance of carbohydrates, protein, fat, vitamins and minerals - calorific value of food – energy requirements of individuals - balanced diet.

**UNIT - II FOOD ADDITIVES**

Definition, food colourants : natural and artificial - antioxidants, stabilizers, flavours, bleaching and maturing agents – leavening agents.

**UNIT - III FOOD PRESERVATIVES**

Definition - classification - methods of food preservation and processing by heat, cold, radiation, drying and deep freezing.

**UNIT - IV FOOD ADULTERATION**

Definition – types – detection and analysis of adulterants in foods: milk, chilli powder, coffee powder, turmeric powder, ghee, oil and pulses.

**UNIT -V QUALITY STANDARDS**

Quality control - specification and standards - FA, WHO standards – packing and labeling of foods, Essential Commodities Act - Consumer Protection Act - AGMARK.

**Reference books:**

1. Sivasankar B, Food Processing and Preservation, Prentice Hall of India Pvt. Ltd, New Delhi, 2002.
2. Swaminathan M. Textbook on Food Chemistry, Printing and Publishing Co, Ltd, Bangalore 1993.
3. Food Science – III Edition – Sri Lakshmi B, New Age International Publisher, 2005.
4. Fundamentals of Foods and Nutrition – Mudambi. R. Sumathi, and Rajagopal, M.V. - Willey Eastern Ltd, Madras.

**Non Major Elective- I (B)**

**WATER MANAGEMENT**

**Objectives:**

To realize the importance of quality water in day to day life

**UNIT I - WATER POLLUTION**

Definition-sources of water pollution-types of water pollutants: sewage and domestic wastes, industrial effluents, agricultural discharges, detergents, disease causing agents and radioactive materials. Eutrophication and its effects.

**UNIT II - WATER QUALITY PARAMETERS**

Physical, chemical and biological water quality parameters-water quality standards for drinking water – BIS and WHO. Determination of pH, Total hardness, DO, BOD and COD.

**UNIT III - WATER PURIFICATION**

Purification of water for drinking purposes: Sedimentation, filtration and disinfection- Desalination: reverse osmosis-Purification of water for industrial purposes: water softening-permutit process and ion-exchange process.

**UNIT IV - WASTE WATER TREATMENT**

Elementary ideas of waste water treatment: pre-treatment-primary treatment-secondary treatment: aerobic and anaerobic processes –tertiary treatment: evaporation adsorption –chemical precipitation.

**UNIT V - RESTORATION AND MANAGEMENT**

Importance of lakes and rivers-stresses on the Indian rivers and their effects –A restoration case study: Ganga Action Plan: objectives implementation and drawbacks. Rain water harvesting –water recycling-The water Prevention and control of Pollution Act 1974.

**Reference books :**

1. A. K. De, Environmental Chemistry, Wiley Eastern Ltd., New Delhi.
2. B. K. Sharma, Environmental Chemistry, Goel Publishing House, Meerut.
3. R. K. Trivedy and P. K. Goel, Chemical and biological methods for water pollution studies, Environmental Publications, Karad, India.
4. BIS 1991, Specification for drinking water, Bureau of Indian Standards, New Delhi
5. WHO 1992, International standards for drinking water, World Health Organisation, Geneva.

**PHYSICAL CHEMISTRY -II**

**UNIT -I THERMODYNAMICS-I**

Basic concepts - system, surroundings - types of systems - extensive and intensive properties - state functions and path functions - types of processes - . Exact and inexact differentials -Zeroth law of thermodynamics. Statements of first law - definition of internal energy and enthalpy - heat capacities at constant volume ( $C_v$ ) and at constant pressure ( $C_p$ ), relationship between  $C_p$  and  $C_v$  - calculation of work, heat, internal energy change and enthalpy change for the expansion of an ideal gas under reversible isothermal and adiabatic conditions. Joule-Thomson effect – Joule-Thomson coefficient and its significance - derivation of the expression for Joule-Thomson coefficient - inversion temperature. Kirchoff's equation and its applications - numerical problems.

**UNIT II: THERMODYNAMICS-II**

Introduction to second law of thermodynamics - spontaneous processes - statement of second law of thermodynamics.

Entropy: Definition –entropy a state function - Trouton's rule. -entropy change in reversible and irreversible processes- Clausius inequality- entropy as function of T and V - entropy as a function of T and P - entropy change in isothermal transformation - entropy change accompanying change of phase— entropy of mixing of ideal gases -physical significance of entropy.

Free energy: Work and free energy functions – definition-general conditions of equilibrium and spontaneity – -physical significance of  $dA$  and  $dG$ . Temperature and pressure dependence of  $G$  - variation of  $G$  during isothermal change -Gibbs Helmholtz equation

**UNIT III: CHEMICAL EQUILIBRIUM**

Reversible and irreversible reactions-nature of chemical equilibrium-Law of mass action-equilibrium constants-  $K_p$ , and  $K_c$  Thermodynamic derivations- -Relations between  $K_p$  &  $K_c$  Temperature dependence of equilibrium constant-properties of equilibrium constant –Pressure dependence of equilibrium constant- Application of law of mass action to homogenous and Heterogenous equilibrium- Le-Chatelier principle-application of Le-Chatelier principle to homogenous equilibrium and heterogenous equilibrium –effect of inert gas on equilibrium

#### **UNIT IV : SOLUTIONS**

Kinds of solutions — methods for expressing concentration – Molarity, molality, mole fraction, normality, mass fraction, parts per million -solutions of gases in liquid -Solubility of gases in liquids – Henry's law – statement and limitations.

Solutions of liquid in liquid– Binary liquid mixture - Ideal and non ideal solutions – Raoult's law. - deviation from ideal behavior – pressure – composition and temperature – Composition diagrams for completely miscible binary solutions-Fractional distillation –Azeotropic distillation—nature of azeotropic mixtures-partially miscible liquids—consolute temperature- critical solution temperature-system with upper CST, lower CST and upper and lower CST –Liquid crystals, Nematic, Smectic and cholesteric types and their applications

#### **UNIT-V ELECTROCHEMISTRY-I**

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. Migration 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. Ionic mobilities and Ionic conductances. Diffusion and ionic mobility- molar ionic conductance and viscosity- Walden rule-Applications of conductance measurements – Degree of dissociation of weak electrolytes – Determination of Ionic product of water – Determination of solubility of sparingly soluble salts – conductometric titrations- Theory of strong electrolytes – Debye – Huckel – Onsager theory-verification of Onsager equation – Wien and Debye –Falkenhagen effect.

#### **Reference books:**

1. Principles of physical chemistry - Puri, Sharma and Pathania, Millennium Edition, Vishal Publishing Co
2. Text Book of physical chemistry - P.L. Soni - Sultan Chand.
3. Atkins' Physical chemistry, 9<sup>th</sup> Edition, Oxford University Press.
4. Advanced Physical Chemistry - Gurdeep Raj, Goel Publishing House.
5. Physical Chemistry, G.M.Barrow, Tata McGraw Hill.
6. Thermodynamics for chemist S.Glasston
7. Physical chemistry P.K.Sharma and L.K.Sharma.

**Major Practical - III**

**INORGANIC QUANTITATIVE ANALYSIS**

**Objectives**

- ❖ To enable the students to understand various procedures in salt analysis.
- ❖ To create an awareness on ecofriendly approach in salt analysis

Qualitative analysis of inorganic salt mixtures containing two acidic radicals (one should be an interfering radical) and two basic radicals

4. Acidic radicals

Simple acidic radicals:

Carbonate, Nitrate, Sulphate, Chloride and Bromide.

Interfering acidic radicals:

Borate, Fluoride, Oxalate and Phosphate.

5. Basic radicals

Group I : Lead

Group II : Copper, Cadmium, Bismuth.

Group III : Ferric iron

Group IV : Cobalt, Nickel, Manganese, Zinc.

Group V : Barium, Strontium, Calcium

Group VI : Magnesium, Ammonium.

Internal – 25 marks

05 marks - Regularity

20 marks – Average of best eight salt mixtures in regular class work

External -75 marks

15 marks – Record (atleast 8 salt mixtures)\*

60 marks – Analysis (15 marks for each radical)

\*Experiments done in the class alone should be recorded

(Students having a bonafide record only should be permitted to appear for the practical examination)

**Reference books:**

1. V.V. Ramanujam, Inorganic Semi Micro Qualitative Analysis, 3rd edition, The National Publishing Company, Chennai, 1974.
2. Vogel's Text Book of Inorganic Qualitative Analysis, 4th edition, ELBS, London, 1974



**ALLIED CHEMISTRY - II**

**Objectives**

- To learn the chemistry of basic aromatic compounds.
- To understand the nuclear particles and few nuclear reactions
- To know about carbohydrates, amino acids, proteins and nucleic acid.
- To study about fuels, fertilizers, cement and glass.
- To know about some common diseases and the drugs used.

**UNIT 1: ORGANIC CHEMISTRY**

**Aromatic compounds**

General characteristics of aromatic compounds - aromaticity – Huckel’s rule with examples- non – benzenoid aromatic compounds (definition and examples only)

Preparation, properties and structure of benzene and naphthalene.

**UNIT 2 : PHYSICAL CHEMISTRY**

**Nuclear chemistry**

Nuclear stability – n/p ratio – packing fraction – mass defect – binding energy - isotopes, isobars, isotones with examples. Separation of isotopes by diffusion method – group displacement law - radioactive series - Nuclear fission, fusion - Application of radio isotopes (radio diagnosis and therapy, C-14 dating).

**UNIT 3 :**

**BIO CHEMISTRY**

Carbohydrates –definition and classification – artificial synthetic sweeteners. Amino acids - classification – amphoteric nature – isoelectric point. Proteins - classification according to composition, solubility and shape - colour reactions - biological action . Nucleic acids – purines, pyrimidines, nucleocides, nucleotides – DNA – structure of DNA – RNA - different types of RNA

#### **UNIT 4 : INDUSTRIAL CHEMISTRY**

Fuel gases – Water gas, Producer gas, L.P.G, Gobar gas and Natural gas. Fertilizers – N.P.K and mixed fertilizers. Soaps and detergents – an elementary idea of soaps and detergents. Cleansing action of soaps and detergents. Cement and glass: Portland cement-manufacture only. Manufacture of glass- types and uses borosilicates -photochromic and safety glass.

#### **UNIT-5: PHARMACEUTICAL CHEMISTRY**

Common diseases – infective diseases – insect borne –air borne – water borne – hereditary diseases. Definition and examples of analgesics, antipyretics, sulpha drugs, antimalarials and, antibiotics. Diabetes – causes – hyper and hypoglycemic drugs. Indian medicinal plants – tulsi, neem, keezhanelli- their importance

#### **Reference Books**

1. Puri, Sharma & Kalia, Principles of Inorganic Chemistry, Milestone Publishers and Distributors, 2008.
2. P.L. Soni, Text book of Inorganic Chemistry, Sultan Chand and Sons, 2007.
3. Bahl and Arun Bahl, Organic Chemistry, S. Chand and Sons, New Delhi , 2005.
4. Morrison & Boyd, Organic Chemistry, VI<sup>th</sup> ed, Prentice Hall of India Pvt. Ltd., New Delhi, 1998.
5. P. L. Soni, Text book of Organic Chemistry, S. Chand and Company Ltd., New Delhi .
6. J. L. Jain, Sunjay Jain and Nitin Jain, Fundamentals of Biochemistry, S. Chand and Company Ltd.,New Delhi, 2005.
6. S. Lakshmi, Pharmaceutical Chemistry, S. Chand and Sons, New Delhi , 1995.

**Allied Practical - IV**

**Quantitative Analysis**

**Objective:**

To enable the students to acquire the quantitative skills in volumetric analysis.

Acidimetry and alkalimetry

12. Estimation of oxalic acid – Std. oxalic acid
13. Estimation of  $\text{Na}_2\text{CO}_3$  – Std.  $\text{Na}_2\text{CO}_3$
14. Estimation of hydrochloric acid – Std. oxalic acid

Permanganometry

15. Estimation of ferrous ammonium sulphate – Std. ferrous ammonium sulphate
16. Estimation of oxalic acid – Std. oxalic acid
17. Estimation of ferrous sulphate – Std. oxalic acid
18. Iodometry
19. Estimation of  $\text{K}_2\text{Cr}_2\text{O}_7$  – Std.  $\text{K}_2\text{Cr}_2\text{O}_7$

Dichrometry

20. Estimation of ferrous iron – Std. ferrous ammonium sulphate

Complexometry

21. Estimation of Zn – Std.  $\text{ZnSO}_4$
22. Estimation of Mg – Std.  $\text{ZnSO}_4$

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**Note:**

Internal – 25 marks

5 marks - Regularity

20 marks – Average of best eight estimations in regular class work

External -75 marks

15 marks – Record (atleast 8 volumetric estimations)\*

10 marks – Procedure

50 marks – Result

\*Experiments done in the class alone should be recorded

(Students having bonafide record only should be permitted to appear for the practical examination)

**Skilled Based –II (A)**

**Chemistry in Medicine**

**Objectives**

- To have knowledge of first aid and the important rules.
- To know the common chemicals in medicine
- To have awareness of common diseases
- To learn the diagnostic tests and to know the importance of vitamins.

**Unit- I: FIRST AID**

First Aid for accidents-important rules-first aid kit ,First aid for cuts, bruises, bleeding, fractures, burns, fainting and poisonous bites. Common poisons-Acid poisoning-antidote, Alkali poisoning-antidote, Poisoning by disinfectant- symptoms-antidote, Alkaloid poisoning-symptoms-antidote, alcohol poisoning-symptoms-antidote, Mercury poisoning-antidote and Salicylate poisoning-antidote.

**Unit-II: CHEMICALS IN MEDICINE**

(Preparations and chemical equations not required) Alum-properties and uses- Aluminium hydroxide gel-uses-Dried Aluminium hydroxide gel-uses-Aluminium acetate-uses-Ferrous fumarate-uses-Ferric ammonium citrate-uses.Ferrous gluconate-uses,Ferrous sulphate. Biological importance of sodium, potassium, calcium ,Iodine and copper.

**Unit-III: CAUSES AND TREATMENT OF SOME COMMON DISEASES:**

Insect borne diseases – malaria and filariasis Prevention and treatment. Air borne diseases – diphtheria, whooping cough, influenza, measles, mumps, common cold, tuberculosis and leprosy- Prevention and treatment. Water borne – cholera, typhoid and diarrhoeal diseases -Prevention and treatment. Respiratory disorder – Prevention and treatment of asthma .Nervous disorder – epilepsy—Prevention and treatment - other diseases – Peptic ulcer- treatment.

**Unit- IV: CLINICAL CHEMISTRY**

Clinical chemistry – Composition of blood – blood grouping - determination of blood groups and matching – blood pressure – hypertension – determination.Determination of glucose in serum – Folin and Wu's method - determination of serum cholesterol – Sackett's method – tests for cholesterol. Estimation of glucose in urine – Diagnostic test for sugar in urine- Benedict's test-Clinistix-strip test Diagnostic test for salts in urine and serum. Detection of diabetes ,detection of anaemia. Estimation of hemoglobin( Hb concentration) – estimation of red blood cells Normal RBC count in adults.

**Skilled Based –II (A)**

**Unit V : HEALTH CARE MEDICINES**

Vitamins-Classification of Vitamins-Sources- deficiency diseases of Vitamins A, D, E, K, B<sub>1</sub>, B<sub>2</sub>, B<sub>c</sub>, B<sub>6</sub>, B<sub>12</sub> and C –Therapeutic uses. Treatment of ulcers and skin diseases.

**Books for Reference.**

1. Practical Biochemistry – David Plummer – 2005, Tata McGraw-Hills Publishing Company.
2. Text Book of Pharmaceutical Chemistry – Jeyashree Gosh – 2003, S.Chand and Company, New Dehi.
3. Medicinal Chemistry – G.R.Chatwal, 2002, Himalaya Publishing House, New Delhi.

**Skilled Based-II (B)**

**INDUSTRIAL CHEMISTRY**

**Objectives:**

To gain knowledge about systems of units and conversion factor

To understand utilities in chemical industries

To know the severity of corrosion and methods of preventing it

To study the industrial process of silicate industry

To acquire the knowledge about the unit process

**UNIT I - UNITS AND DIMENSIONS, MATERIAL BALANCE**

Fundamental and derived quantities – System of unit – significance of dimensional analysis – forces – weight – volume – pressure – work – energy – power. Basic chemical calculations: Atomic mass – Molar mass – concept of mole, gmol, comparison of liquid mixtures and gaseous mixtures, percentage of mass, volume and mol – ideal gas laws – Dalton's law, Amagat's law and Henry's law – density and pressure measurements.

Material balance without chemical reaction: Material balance equation – transient and steady state – simple material balance with and without recycle and bypass or chemical engineering operations such as evaporation, drying, filtration, extraction and crystallization.

**UNIT II - FUELS AND FURNACES**

Fuels – types of fuels – calorific values – ignition point – pyrometric effect – explosives range – Flue gas analysis by Orsat's method – explosives – classifications – low explosives – initiating explosives – high explosives – rocket propellants – nuclear fuels.

Furnaces – types of furnaces – Kilns – Blast furnace, reverberatory furnace – muffle furnace – electric furnace – regenerative furnace, open hearth furnace – Bessemer converter – vertical retort furnace.

**UNIT III - CORROSION AND PROTECTIVE COATING**

Introduction – severity of corrosion – chemical and electrochemical corrosion – mechanism – factors influencing corrosion – control of corrosion – cathodic and anodic protection.

Paints – characteristics of paint – constituents of paints - pigments – vehicles – thinners – driers – fillers – plasticizers – anti skinning agents – their function and properties.

Metallic coating – removal of surface contamination – removal of superficial corrosion products – polishing – galvanizing – tinning – electroplating.

**Skilled Based-II (B)**

**UNIT IV - SILICATE INDUSTRY**

Refractories – requirements of refractories – properties of refractories – solid refractories – fire clay refractories – magnesite refractories, dolomite bricks, graphite refractories, zirconia refractories, silicon carbide.

Abrasives – classifications – natural (diamond, corundum, emery, garnet, quartz and flint) and artificial (carborundum, alundum, boron carbide, metallic abrasives). Uses of abrasives – cement manufacture – setting and hardening of cements – gypsum – plaster of Paris – manufacture – setting and hardening – uses. White wares manufacture – types – glazing.

**UNIT V - UNIT PROCESSES IN ORGANIC MANUFACTURE**

Sulphonation – uses and applications of sulphonates and sulphates – sulphonating agents – sulphur trioxide – organic complexes – chemical and physical factors in sulphonation – commercial sulphonation of benzene – batch vs continuous sulphonation. Hydrolysis – hydrolyzing agents – mechanism of hydrolysis.

Oxidation – types of oxidation reactions – oxidizing agents – permanganate and dichromate – liquid phase oxidation – vapour phase oxidation – commercial manufacture of acetic acid. Hydrogenation – catalysts for hydrogenation - hydrogenation of vegetable oils.

**Reference books:**

1. Industrial Chemistry, B. K. Sharma, Goel Publishing House, Meerut.
2. Industrial Chemistry, B. N. Chakrabarty, Oxford & IBH Publishing Co. Pvt. Ltd. Calcutta.
3. Unit Operations I & II K. A. Gavhane, Nirali Prakashan, Pune.
4. Unit Processes in Organic Synthesis, P. H. Groggins, Tata McGraw-Hill Publishing Company limited, New Delhi.
5. Stoichiometry – B. Z. Bhatt and S. M. Vora.
6. Engineering Chemistry, Jain and Jain.

**Non Major Elective -II (A)**

**DAIRY CHEMISTRY**

Objectives:

- To learn the composition and properties of milk
- To understand the chemical composition of milk and milk processing.
- To know the chemistry of cream and butter
- To study to fermented milk products
- To know the condensed milk and dairy detergents

**UNIT-I PROPERTIES OF MILK**

Definition, Composition, Milk lipids, Milk proteins, vitamins and minerals. Factors affecting the composition of milk - adulterants, preservatives, and neutralizer - examples and their detection.

**UNIT-II PROCESSING OF MILK**

Destruction of microorganisms in milk – physicochemical changes during processing – boiling, pasteurization – pasteurization types – bottle pasteurization –batch pasteurization – HTST (High Temperature Short Time) – vacuum pasteurization –(UHT) Ultra High Temperature Pasteurisation.

**UNIT-III MILK PRODUCTS-I**

Milk Products: Cream - definition, classification – manufacturing - chemistry of creaming process - physico-chemical properties – separation of cream , estimation of fat in cream , Butter - definition, classification, composition, theory of churning, desibutter, salted butter. Ghee - major constituents, common adulterants and their detection.

**UNIT-IV MILK PRODUCTS-II**

Fermented milk products - fermentation of milk - definition and conditions. Ice creams - definition, composition, types, manufacture of ice - cream, stabilizers, emulsifiers, and their role, milk powder - definition, process of making milk powder.

**UNIT –V CONDENSED MILK AND DAIRY DETERGENTS**

Condensed milk – definition, classification and differences between condensed milk and skim – condensed milk – sanitation - pasteurization – nutritive value of milk – difference between cow milk and buffaloes milk- milk enzymes. Dairy Detergents : Definition-characteristics-classification-washing procedure (modern method) sterilization-chloramin-T and hypochlorite solution.



**Non Major Elective –II (A)**

**Reference books :**

1. Applied Chemistry-K.Bagavathi Sundari MJP Publishers Chennai. 2006.
2. Principles of dairy technology - Robert Jenness, Wiley, New York
3. Indian Dairy Products - Rangappa and Acharya, K.T. Asia Publishing House, Bombay, India.
4. Fundamentals of Dairy chemistry - Wond. F.P. Springer.
5. Outlines of Dairy Technology - Sukumar De. – Oxford University Press.
6. Applied chemistry for home science & allied science - T.Jacob, Mcmillan.

**Non Major Elective –II (B)**

**APPLIED CHEMISTRY**

**Objectives:**

To acquire knowledge about the chemicals used in day to day life

**UNIT I - SOAPS AND DETERGENTS**

Soaps: Definition-classification-raw materials used in the manufacture of soap –manufacture of toilet soap.

Detergents: Definition –various types with examples- advantages of detergents over soaps –cleansing action of soap.

**UNIT II- FERTILIZERS**

Definition-characteristics of a good fertilizer- role of nitrogen, potassium and phosphorous in plant growth – natural fertilizers- chemical fertilizers: urea, muriate of potash and triple superphosphate - mixed fertilizers - biofertilizers – advantages of biofertilizers.

**UNIT III - POLYMERS**

Fibers: Classification –uses of terylene, nylon and orlon.

Resins: Natural resins- synthetic resins-type-uses of fevicol, quick fix, araldite, glyptal and Bakelite.

Plastics: classification- differences between thermoplasts and thermosets. Advantages of plastics-uses of polythene, PVC, polystyrene, Teflon and thermocole.

Rubber: Types-defects in natural rubber-vulcanization-synthetic rubbers- uses of neoprene, thiocol, butyl rubber, silicone rubber and foam rubber.

**UNIT IV - CHEMICALS IN PHARMACY**

Definition and therapeutic uses of the following (an elementary study only)

Antiseptics: alum, boric acid

Mouth washes: Hydrogen peroxide

Antacids: Aluminium hydroxide

Analgesics: Aspirin, paracetamol

Antibiotics: Penicillins, tetracyclines

Haematinics: Ferrous fumarate, ferrous gluconate

Laxatives: Epsom salt, milk of magnesia

Sedatives: Diazepam

**Non Major Elective -II (B)**

**UNIT V - CHEMICALS IN DAY-TO-DAY LIFE**

An outline of the preparation and uses of the following articles.

Tooth powder, tooth paste, writing inks, gum paste, boot polish, talcum powder, chalk crayons, agar battis, phenyl and moth balls.

**Reference books:**

1. B. K. Sharma, Industrial Chemistry, Goel Publishing House, Meerut.
2. Jeyashree Gosh, A text book of Pharmaceutical Chemistry, S. Chand and Company, NewDelhi.
3. B. N. Chakrabarty, Industrial Chemistry, Oxford and IBH Publishing Co. Pvt.Ltd., Calcutta.