Swami Ramanand Teerth Marathwada University, Nanded

B. O. S. IN CHEMISTRY

B. SC. SECOND YEAR (CHEMISTRY)

SEMESTER-III & IV

CBCS Course

Effective from JUNE - 2017

Swami Ramanand Teerth Marathwada University, Nanded

Choice Based Credit System (CBCS) Course Structure

Faculty of Science

B. Sc. Second Year Syllabus

Semester Pattern effective from June 2017

Subject: Chemistry

Semester	Course No.	Name of the Course	Instruction Hrs/ week	Total period	CA (Int.)	ESE (Ext.)	Total Marks	Credits
III	CCC III (Section A)	Theory Paper-VI Organic+Inorganic Chemistry (P-VI)	03	45	10	40	50	02
	CCC III (Section B)	Theory Paper-VII Physical+Inorganic Chemistry (P-VII)	03	45	10	40	50	02
	CCCP- II [CCC III & IV (Section A)]	Practical's based on P-VI & P-VIII (P-X)	04 04	Practicals 08 08	05 05	20 20	25 25	01 01
	SECC I	SEC I (Anyone Skill from optional)	02+01=03	45	25	25	50	(02)*
IV	CCC IV (Section A)	Theory Paper-VIII Organic+Inorganic Chemistry (P-VIII)	03	45	10	40	50	02
	CCC IV(Section B)	Theory Paper-IX Physical+Inorganic Chemistry (P-IX)	03	45	10	40	50	02
	CCCP III [CCC III & IV (Section B)]	Practical's based on P-VII & P-IX (P-XI)	04 04	Practicals 08 08	05 05	20 20	25 25	01 01
	SECC II	SEC II (Anyone Skill from optional)	02+01=03	45	25	25	50	(02)*
Total credits semester III and IV								**12(04)***

CCC: Core Course Chemistry, **CCCP:** Core Course Chemistry Practical, **ESE:** End of Semester Examination,

CA: Continuous Assessment, **SECC:** Skill Enhancement Course Chemistry.

Distribution of Credits: 80% of the total Marks for ESE and 20% for CA.

- **CA of Marks 10 :** 10 Marks for test.
- **CA of 25 Marks :** 15 Marks for Seminar & 10 Marks for test.

B. Sc. Second Year: Semester-III

Paper-VI, (CCC-III, Section A)

Organic & Inorganic Chemistry

Credits:02 **Periods: 45**

Part I (Organic Chemistry)

Unit:-I

Name Reaction with Mechanism **10**

[A] Condensation reactions of Aldehydes and Ketones.

1. Benzoin Condensation Reaction.
2. KnoevengeI Reaction.
3. Mannich Reaction
4. Perkins Reaction,
5. Reformatsky reaction.
6. Gatterman Koch reaction.
7. Gatterman synthesis.

[B] Reduction reactions

1. Clemmensen Reduction Reaction.
2. Meervin-Pondorof Verly reduction reaction.
3. Reduction with $LiAlH_4$.
4. Reduction with $NaBH_4$.

[C] OXIDATION REACTIONS.

1. Baeyer- Villiger Oxidation Reaction.
2. Oppenauer oxidation.

Unit:- II

Aromatic Carboxylic and Sulphonic Acids. **06**

1. Introduction and Classification of Aromatic Carboxylic Acids.
2. Synthesis and Chemical Reactions of Following Acids.

[A] Benzoic Acid.

1. Preparations From: (a) Phenyl Cyanide, (b) Toluene.
2. Reactions of Benzoic Acids**:**

a) Acyl halide formation b) Reduction. C) Nitration.

[B] Anthranilic Acid:

1. Preparations From : (a) Phthalimide. b) O-nitroToluene.

2. Reactions of Anthranilic Acids:

a) Action of heat, b) Nitrous Acid, c) Action of acetic anhydride/acetyl chloride.

[C] Salicylic Acid:

1. Preparations From: (a) Kolbe's reaction. (b) Reimer-Tiemann reaction.

2. Reactions of Salicylic Acids:

a) Bromination, b) Nitration, c) Decarboxylation, d) Reaction with Zn-dust.

[D] Phthalic Acid

1. Preparations From: (a) o-xylene. (b) Naphthalene.

2. Reactions of Phthalic Acids:

a)Action of heat. b) Action of $PC1_5$. C) Action of ethanol.

[E] Benzene Sulphonic Acid.

1. Introduction.

2. Preparation of benzene sulphonic acid from benzene with mechanism.

3. Chemical Reactions of benzene sulphonic acid,

a) Salt formation b) formation of sulphonyl chloride,

c) formation of sulphonic ester and amide.

4. Replacement of sulphonic group by:

a) Hydroxyl group. b) cyano group, c) Hydrogen atom d) NH_2 –group.

Unit:- III

[A] Introduction to Organometallic Compounds. 09

1. Organomagnesium Compounds:

1. Preparation of Methyl magnesium bromide.

2. Synthetic applications of Methyl magnesium bromide (CH_3MgBr) : Hydrocarbons, Ethanol, 2-propanol, 2-methyl-2-propanol, Ethanal, 2-propanone, ethanoic acid, Methanamine, Acetonitrile, Ethyl ethanoate..

2. Organo Lithium Compounds.

1. Preparation of methyl lithium from methyl iodide.

2. Synthetic application of Methyl lithium(CH_3Li): Methane, Ethanol, 1-propanol, 2-propanol.

3. Organo Zinc Compounds:

1. Preparation of diethyl zinc from ethyl iodide.

2. Synthetic application of diethyl zinc [$(C_2H_5)_2Zn$]: Methane, 2-propanone, Ethanol, 2-propanol.

[B] Organic Synthesis via Enolates.

1. Introduction, Acidity of alpha hydrogen.
2. Synthesis of Ethyl Acetoacetate. [Claisen Condensation Reaction with Mechanism]
3. Ketol-EnolTautomerism of ethyl acetoacetate.
4. Synthetic Applications of Ethyl Acetoacetate.
5. Synthesis of Enamines, Acetylation and Alkylation of Enamines.

Unit:- IV

Oils, Fats, Soaps and Detergents **05.**

A. Introduction, chemical nature, General physical properties and

1. General chemical properties.

a) Hydrolysis

b) hydrogenation

c) hydrogenolysis

d) trans-esterification

e) Rancidity and autoxidation.

f) Analysis of Fats and Oils.

i) Saponification number (Saponification value)

ii) Iodine number (Iodine value)

iii) Acid value

iv) Reichert Meissl value (R. M. value)

B] SOAPS

1. Introduction,
2. Manufacture of soaps by

i) Kettles process

ii) Hydrolyser process.

iii) Cleansing action of soap.

C] Synthetic Detergents.

1. Introduction,
2. Synthetic detergent classification,

i) Anionic detergent

ii) Cationic detergents

iii) Non ionic detergents.

3. Synthetic detergent versus soaps, Soft versus Hard detergents.

Part II (Inorganic Chemistry)

Unit:-V

[A] Theory of Qualitative Analysis **09**

a) Introduction: Definition of qualitative analysis, macro, micro and semimicro qualitative analysis, radicals, acidic and basic radicals.

b) Role of sodium carbonate extract in qualitative analysis.

c) Interfering radicals. Removal of interfering radicals such as oxalate, borate, fluoride and phosphate.

d) Use of solubility product, common ion effect and complex ion formation in the analysis of basic radicals:

i) Separation of II_A and II_B, ii) Separation of II and III_B.

iii) Separation of III_A and III_B, iv) Separation of Zn^{++} and Mn^{++}.

v) Separation of Co^{++} and Ni^{++} vi) Separation of Fe^{+++} and Al^{+++}.

vii) Separation of Cu^{++} and Cd^{++}.

e) Use of organic reagents in qualitative analysis.

i) 8-Hydroxy quinoline for aluminium ii) α-Benzoinoxime for copper.

iii) Dimethylglyoxime for Nickel iv) 1,10-Phenonthroline for Iron.

v) α-Nitroso-β-naphthol for cobalt.

[B] Non-aqueous Solvents **06**

a) Introduction

b) Classification of Solvents.

c) Water as a universal solvent

b) Physical properties of solvent: Dipole moment, Dielectric Constant, Trouton's Constant, Viscosity. Melting Point & Boiling Point.

c) Reactions in liquid ammonia as solvent : Auto ionization, Acid-Base, Ammonolysis, Precipitation and ammonation.

d) Reactions in liquid SO_2 :

Autoionization, Acid-Base, Solvolysis, Precipitation and Solvation.

Reference books:

1. Organic chemistry by Morrison and Boyd, Print ice hall.
2. Organic chemistry by L.G. Wade. Print ice hall.
3. Organic chemistry Vol. I, II, III by S. M. Mukharji, S. P. Sing and R. P. Kapoor
4. Fundamental of organic chemistr y b y Solomon, John willey
5. A Text book of organic chemistry by Bahl and Bahl.
6. A Text book of organic chemistry by P. L. Soni.
7. A Text book of organic chemistry by Tewari Mehrotra.
8. Stereochemistr y by P. S. Kalsi.
9. Organic chemistry by I. L. Finar.
10. Principles of Inorganic Chemistry by Puri, Sharma and Kaliya.
11. Advanced inorganic chemistry by Gurudeep Raj and ChatwalAnand.
12. Advanced inorganic chemistry vol. II by Satyaprakash, Tuli, Basu and Madan.
13. Inorganic Chemistry by Huheey, Keiter and Keiter.
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15. Concise Inorganic Chemistry by J. D. Lee.
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17. A text book of Practical Chemistry for B. Sc. By V. V. Nadkarny, A. N. Kothare and Y. V. Lawande.
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20. Inorganic Chemistry by A. G. Sharp.
21. Inorganic Chemistry by G. L. Miessler and D. A. Tarr.
22. Chemistry for degree students by Dr. R.L. Madan, (S. Chand)

B. Sc. Second Year: Semester-III

Paper-VII, (CCC III, Section B)

Physical & Inorganic Chemistry

Credits:02 **Periods: 45**

Part I (Physical Chemistry)

Unit :- I **10.**

Atomic Structure and Wave Mechanics

1.1 Planck's quantum theory.

1.2 Photoelectric effect, explanation on the basis of quantum theory.

1.3 Compton Effect: Statement, explanation.

1.4 de-Broglie hypothesis; derivation of de-Broglie equation, explanation.

1.5 Davisson-Germer experiment.

1.6 Heisenberg's uncertainty principle: Statement, explanation.

1.7 Schrodinger wave equation; Derivation in time independent form and Laplacian operator form, Physical significance of wave function (Ψ) and (Ψ_2).

1.8 Numerical on photoelectric effect, de-Broglie equation, Heisenberg's uncertainty principle.

Unit :- II **05**

Thermodynamics:

2.1 Introduction to First law of thermodynamics.

2.2 Joule's law. Joule-Thomson effect. Joule-Thomson coefficient and inversion temperature.

2.3 Need for second law thermodynamics, different statements of second law of thermodynamics.

2.4 Carnot's cycle and its efficiency. Carnot's theorem.

2.5 Numerical on efficiency of Carnot cycle.

Unit:- III

Concept of entropy: **06**

3.1 Introduction, Definition, Mathematical Expression, Unit.

3.2 Entropy as a state function.

3.3 Entropy change in Physical transformations: (i) Fusion of a solid. (ii) Vaporization of a liquid. (iii) Transition from one crystalline form to another.

3.4 Entropy changes for an ideal gas as a function of V and T and as a function of P and T.

3.5 Entropy changes of an ideal gas in different processes.

3.6 Physical significance of entropy.

3.7 Numerical on entropy change in physical transformations and entropy changes of an ideal gas in different processes.

Unit:- IV **09.**

Phase equilibrium

4.1 Phase rule, Statement and explanation of the terms-phase, component and degree of freedom.

4.2 Phase equilibria of one component system: Water system, Sulphur system and CO_2 system.

4.3 Phase equilibria of two component system: Pb-Ag system, desilverisation of lead, KI-H_2O system.

4.4 Partially miscible liquids: Critical solution temperature, upper critical solution temperature, lowers critical solution temperature. Phenol-water, triethylamine-water, nicotine-water systems. Effect of impurities on critical solution temperature.

Part II (Inorganic Chemistry)

Unit:- V

[A] Nuclear Chemistry: **10**

a) Introduction, composition of nucleus and nuclear size.

b) Classification of nuclides: Isotopes, isobars, isotones, isotones and isomers.

c) Nuclear Stability: Odd and even number of protons and neutrons, N/Z ratio, magic number, packing fractions (Numerical), mass defect (Numerical), nuclear binding energy (Numerical) and mean nuclear binding energy (Numerical).

d) Release of nuclear energy:

i) Nuclear fission reaction, nuclear fuels and plutonium bomb.

ii) Nuclear fusion reaction, the energy of sun, hydrogen bomb.

e) Definition of radioactivity, characteristics of α, β, and γ particles, group displacement law.

f) Application of radioisotopes in medicine, agriculture, industry, and carbon dating.

[B] Theory of Gravimetric Analysis **05**

a) Introduction , definition of gravimetric analysis.

b) Steps involved in gravimetrc analysis

c) Precipitation, Conditions for Prcipitation

d) types of precipitates.

e) Factors affecting precipitation such as temperature and pH,

Solubility and Solubility Product.

f) Different Steps involved in gravimetric analysis:

i) Precipitation, ii) Digestion , iii) Filtration & Washing, iv) Drying,v) Ignition

& Inceneration, vi) Weighing.

Reference Books:

1. Physical Chemistry by G. M. Barrow (Tata Mc-Graw Hill publishing Co., Ltd.)

2. Elements of Physical Chemistry by S. Glasstone & D. Lewis (D.van nostrand co. Inc.)

3. Physical Chemistry by W. J. Moore (Orient Longman).

4. Principles of Physical Chemistry by S. H. Maron and C. F. Prutton. (Oxford & IBH Publishing Co.)

5. University General Chemistry by C. N. R. Rao (Mc-Millan).

6. Elements of Physical Chemistry by P. W. Atkins. (Oxford University Press).

7. Physical Chemistry by R. A. Alberty (Wiley Eastern Ltd.).

8. Physical Chemistry through problems by S. K. Dogra, D. Dogra(Wiley Eastern Ltd)

9. Principles of Physical Chemistry by Puri, Sharma and Pathania (Vishal Publication Jallandher,Delhi)

10. Physical Chemistry by A. J. Mee. ELBS & Heinemann Educational Books Ltd.

11. Essentials of Physical Chemistry by Arun Bhal, B. S. Bahl and G. D. Tuli. (S. Chand)

12. Chemical Kinetics by K. J. Laidler (Tata Mc-Graw Hill Publishing Co. Ltd).

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14. A Text Book Physical Chemistry by S. Glasstone, (Mac Millan.)

15. Advanced Physical Chemistry by D.N.Bajpai. (S.Chand)

16. Advanced Physical Chemistry by Gurdeep Raj.(Goel publishing house, Meerut).

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B. Sc. Second Year: Semester-IV

Paper-VIII, (CCC IV, Section A)

Organic & Inorganic Chemistry

Credits:02 **Periods: 45**

Part I (Organic Chemistry)

Unit:-I **08**

Stereochemistry

1. Introduction

2. Concept and Types of isomerism. (a) Structural isomerism (b) Stereo isomerism.

3. Types of structural isomerisin [Chain, Position, Functional, Metamerism, Tautomerism]

4. Types of Stereoisomerism [Conformational (n-butane) and Configurational]

5. Geometrical isomerism: Cis -Trans and E and Z system of nomenclature.

6. Optical isomerism**:**

a) Concept of asymmetric carbon atom, Chiral centre.

b) Dextro and Laevo forms, Racemic mixture.

c) Element of symmetry [plane, Centre, and Axis]

d) Concept of Diastereoisomers.

e) Racemic modification. (with one example)

f) Resolution (Concept) (with one example)

g) Walden inversion. (with one example)

h) Relative Configuration and Absolute configuration.[D,L and R,S notations]

Unit:-II **08**

Carbohydrates.

1. Introduction.

2. Classification and Nomenclature

3. Reactions of Monosaccharide's (Glucose and Fructose)

a) Addition reactions b) Ether formation

c) Reduction of glucose d) Oxidation of glucose

e) Osazone formation with mechanism

4. Open and cyclic structure of glucose

5. Determination of ring size

6. Mutarotation with Mechanism.

7. Epimerization.

8. Cyclic Structure of D-glucose.(supporting evidence for six member ring)

9. Interconvertions:

a) Glucose to Fructose.

b) Fructose to Glucose.

c) Glucose to Mannose.

d) Glucose to Arabinose (Ruff Degradation)

e) Arabinose to Glucose (Kiliani synthesis)

10. Pyranose Structure of Glucose.

11. Manufacturing of sucrose (sugar) from sugar cane.

Unit:-III **08**

Nitrogen Containing Organic Compounds.

A] Aromatic Nitro Compounds.

1. Introduction, Nomenclature,

2. Preparation of Nitrobenzene from benzene

3. Physical and Chemical properties of Nitrobenzene.

4. Electrophilic substitution reactions.

5. Reductions: a) in acidic medium. b) In neutral medium.

c) In alkaline medium. d) Electrolytic reduction.

B] Aromatic amines:

1) Introduction, Classification, Nomenclature,

2) Methods of preparations of aniline from

i) chlorobenzene ii) phenol

iii) nitrobenzene iv) from phthalimide

3) Chemical properties.

i) Diazotization reaction. ii) Action of carbon disulphide.

iii) Action of benzoyl chloride. iv) Formation of Schiff's base.

v) Carbylamine reaction. vi)Formation of p-nitroacetanilide

4. Effect of substituent (-NO_2, -OCH_3, -CH_3)on the basicity of aniline.

C] Diazomethane

1. Introduction.

2. Methods of preparations

i) From N-nitroso-N-methylurethane

ii) From nitrous oxide and methyl lithium

3. Reactions of Diazomethane

i) Action of heat ii) Reaction with mineral acid

iii) Reaction with phenol iv) Reaction with ethanol and ethanamine

v) Ring expansion (cyclopentanone to cyclohexanone)

D] Urea:

1. Synthesis of urea by a) Wohlers methods and b) From CO_2.

2. Reactions:

a) Action of heat b) Action of nitrous acid

c) Hydrolysis d) Action of thionyl chloride

e) Action of formaldehyde f) Action of hydrazine

g) Action of acetyl chloride h) Salt formation.

Unit:-IV **06**

Applications of Reagents In Organic Synthesis.

A] Osmium Tetraoxide [OsO_4]

1. Introduction, Preparation

2. Reactions:

a) In the formation of Cis-l,2-diol, b)Acralaldehyde to glyceraldehyde,

c) Cis- hydroxylation of maleic acid, d) 9, 10-dihydroxylation of phenanthrene.

B] Ozone. [O_3]

1. Preparation,

2. Reactions.

a) Synthesis of aldehydes and ketones,

b) Synthesis of dialdehydes and hydroxyl aldehydes,

c) In degradation of alcohols.

C] Selenium Dioxide.[SeO_2]

1. Preparations,

2. Reactions:

a) Oxidation of reactive methylene group into Carbonyl group.

b)In dehydrogenation reactions.

c) allylic hydroxylation and oxidation

D] Boron Trifluoride.[BF_3]

1. Prrparation ,

2. Reactions: In the formation of: a) acids, b) esters c) diketones,

d) Nitration, e) Sulphonation, f) Rearrangement reaction.

Part II (Inorganic Chemistry)

Unit:-V

[A] Chemistry of d-Block Elements **07**

a) General Characteristics of d-Block Elements.

b) Electronic Configuration of Second & Third Transition Series Elements.

c) Comparison of Second & Third Transition Series Elements with first transition series elements.

d) Compounds of i) Rhodium & Irridium ii) Palladium & Platinum iii) Silver & Gold iv) Cadmium & Mercury.

[B] Chemistry of f-Block Elements. **08**

1. Lanthanides:

a) Electronic Configuration.

b) Lanthanide Contraction, Consequences of Lanthanide Contraction and cause of lanthanide contraction.

c) Magnetic Properties of Lanthanides.

d) Variation in properties of lanthanides.

e) Comparison of Characteristics of d & f-block elements.

f) Extraction of Lanthanides by ion exchange method.

g) Applications of Lanthanides.

2. Actinides:

a) Electronic Configuration.

b) Properties of Actinides.

c) Comparison with Lanthanides.

d) Extraction of Uranium from Pitchblend.

e) Physical & Chemical Properties of Uranium.

f) Separation of Neptunium, Plutonium, Americium from Uranium.

g) Nuclear Fuels.

Reference books:

1. Organic chemistry by Morrison and Boyd, Print ice hall.

2. Organic chemistry by L.G. Wade. Print ice hall.

3. Organic chemistry Vol. I, II, III by S. M. Mukharji, S. P. Sing and R. P. Kapoor

4. Fundamental of organic chemistr y b y Solomon, John willey

5. A Text book of organic chemistry by Bahl and Bahl.

6. A Text book of organic chemistry by P. L. Soni.

7. Synthetic Organic Chemistry, by: G. R. Chatwa

8. Organic Chemistry, Reactions, Rearrangements and Reagents, by: O. P. Agarwal

9. Reaction, Rearrangement and Reagents, by: S. N. Sanyal

10. Organic Chemistry 05th edition, by: A. K. Pine.

11. Organic Chemistry, by: Solomons Fryhle

12. A Text book of organic chemistry by Tewari Mehrotra.

13. Stereochemistr y by P. S. Kalsi. [07th edition]

14. Organic chemistry [volume-I] by I. L. Finar.

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B. Sc. Second Year: Semester-IV

Paper-IX, (CCC IV, SectionB)

Physical & Inorganic Chemistry

Credits:02 **Periods: 45**

Part I (Physical Chemistry)

Unit:-I

Chemical Kinetics: **10**

1.1 Introduction: Rate of reaction, Definition and units of rate constant,

Factors affecting rate of reaction, Order and Molecularity of reaction.

1.2 Zero order reaction: Rate expression and Characteristics.

1.3 First order reaction: Rate expression and Characteristics.

1.4 Pseudounimolecular reactions.

1.5 Second order reaction: Derivation of rate constant for equal and unequal

concentrations of the reactants. Characteristics of second order reaction.

1.6 Methods of determination of order of a reaction.

1.7 Collision theory of reaction rates.

1.8 Effect of temperature on reaction rates and Arrhenius equation.

1.9 Numericals on first order reactions, half-life method.

Unit:-II **06**

Electrochemistry:

2.1 Introduction, Conduction of electricity, Types of conductors: electronic and electrolytic.

2.2 Conductance of electrolytes: Conductance, Specificresistance, Specific conductance, Equivalent conductance, Molecular conductance and their units.

2.3 Variation of specific and equivalent conductance with dilution, Equivalent conductance at infinite dilution. Effect of temperature on conductance.

2.4 Conductivity cell, Cell constant and its determination.

2.5 Strong and weak electrolyte. Arrhenius theory of electrolytic dissociation and its limitations. Debye-Huckel theory of strong electrolytes. Relaxation effect and electrophoretic effect, Debye-Huckel Onsager's equation and its verification.

2.6 Migration of ions, Transport number.

2.7 Numericals on Specific conductance, Equivalent conductance and cell constant.

Unit:-III **06**

3.1 Kohlrausch's law, Applications of Kohlrausch's law:

i) Determination of equivalent conductance at infinite dilution of weak electrolytes.

ii) Determination of degree of dissociation.

iii) Determination of solubility of sparingly soluble salts.

iv) Determination of absolute ionic mobility.

v) Determination of ionic product of water.

3.2 Conductometric titrations:

(i) Strong acid against strong base. (ii) Strong acid against weak base

(iii) Weak acid against strong base. (iv) Weak acid against weak base.

(v) Precipitation titration.

3.3 Advantages of conductometric titrations.

Unit:-IV

Photochemistry: **08**

3.1 Introduction to photochemistry, types of chemical reactions, difference between thermal and photochemical reactions.

3.2 Lambert-Beer Law: Light absorption by solution, molar extinction coefficient, transmittance, absorbance, optical density.

3.3 Laws of photochemistry: Grothus-Drapper law, Stark-Einstein law of photochemical equivalence.

3.4 Quantum yield, experimental determination of quantum yield. High and low quantum yield reactions. Reasons for high and low quantum yield.

3.5 Jablonski diagram with various Processes occurring in the excited state. (internal Qualitative description of Fluorescence, phosphorescence, non-radiative processes Conversion, inter- system crossing).Photosensitized reactions. Chemiluminescence.

3.6 Numericals on quantum yield.

Part II (Inorganic Chemistry)

Unit:-V

[A] Chemistry of Non-transition elements **05**

a) Silicates: Definition, Basic Unit of silicate and classification on the basis of basic unit and their characteristics.

b) Zeolite: Definition, preparation, classification and applications. Ultramarine.

c) Carbide: Definition, classification, preparation, properties and structure of ionic or salt like carbides (CaC_2), Metallic carbide (TiC) and covalent carbides (SiC).

d) Fullerene: Preparation, properties, structure and applications.

[B] Chemistry of Halogen compounds **10**

a) **Inter-halogen compounds:**

i)Definition, preparation and structure of XY, XY_3, XY_5, and XY_7 types of inter-halogen compounds.

ii)Pseudo-halogen: Definition, preparation and properties.

b) **Fluorocarbon:** Definition, preparation properties and uses (Teflon).

c) **Polyhalides:** definition, preparation, properties & structure of ICl_2^-, & ICl_4^-

d) **Oxides of halogens:** Preparation, structure & uses of F_2O, Cl_2O, Cl_2O_7, & I_2O_5.

e) **Oxyacids of halogens:** Introduction, oxidation state, structure strength and stability. Basic properties of halogens: I^+ and I^{+3} compounds and their preparation.

Reference Books:

1. Physical Chemistry by G. M. Barrow (Tata Mc-Graw Hill publishing Co., Ltd.)
2. Elements of Physical Chemistry by S. Glasstone & D. Lewis (D.van nostrand co. Inc.)
3. Physical Chemistry by W. J. Moore (Orient Longman).
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9. Physical Chemistry by A. J. Mee. ELBS & Heinemann Educational Books Ltd.

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13. A Text Book Physical Chemistry by S. Glasstone, (Mac Millan.)

14. Advanced Physical Chemistry by D.N.Bajpai. (S.Chand)

15. Advanced Physical Chemistry by Gurdeep Raj.(Goel publishing house, Meerut).

16. Principles of Inorganic Chemistry by Puri, Sharma and Kaliya.

17. Advanced inorganic chemistry by Gurudeep Raj and ChatwalAnand.

18. Advanced inorganic chemistry vol. II by Satyaprakash, Tuli, Basu and Madan.

19. Inorganic Chemistry by Huheey, Keiter and Keiter.

20. Concise Inorganic Chemistry by J. D. Lee.

21 A text book of Practical Chemistry for B. Sc. By V. V. Nadkarny, A. N. Kothare and Y. V. Lawande.

22. Advanced practical inorganic Chemistry by O. P. Agarwal

23. Basic Inorganic Chemistry by F. A. Cotton, G. Wilkinson and P. L. Gaus.

24. Inorganic Chemistry by A. G. Sharp.

25. Inorganic Chemistry by G. L. Miessler and D. A. Tarr.

26. Chemistry for degree students by Dr. R.L. Madan, (S. Chand)

27. Principles of Inorganic Chemistry by Puri, Sharma and Kaliya.

28. Advanced inorganic chemistry by Gurudeep Raj and ChatwalAnand.

29. Chemistry for degree students by Dr. R.L. Madan, (S. Chand)

B. Sc. Second Year: Semester- III &IV

CCCP II (CCC III & IV, Section A)

Practical based on P-VI & P-VIII

Laboratory Course- Paper-X

Credits:02 **Periods: 120**

Note: At least sixteen experiments should be taken.

Part I (Organic Chemistry)

1. Only demonstration

i) Determination of R_f values of O, M and P-nitro aniline.

ii) Separation of benzene and water by distillation method.

2. Qualitative analysis: Identification of following organic compounds.

(Two from each of the following)

a) Acids: Benzoic acid, Phthalic acid, Salicylic acid, Cinnamic acid, o-chloro benzoic acid.

b) Base: Aniline, P-nitroaniline, m-nitroaniline , resorcinol, P-toludiene.

c) Phenols: Phenol, α-naphthol, β-naphthol, p-cresol, m-nitrophenol.

d) Neutral: Naphthalene, Anthracene, Acetanilide, m-dinitrobenzene, Nitrobenzene.

3. **Quantitative analysis: (estimation) any four.**

a) Estimation of glycine by Sorenson's method.

b) Estimation of phenol by bromination method.

C) Estimation of glucose by iodination method.

d) Estimation of unsaturation (cinnamic acid).

e) Estimation of saponification value of an oil.

f) Estimation of iodine value of an oil.

g) Estimation of vitamin-C

h) Estimation of formaldehyde.

Part II (Inorganic Chemistry)

1 Determine volumetrically the amounts of sodium carbonate and sodium hydroxide present together in the given solution provided 0.1 N HCl solution

2 Determine the percentage of $CaCO_3$ in the chalk sample, provided 1 N Hcl and 0.1N NaOH

3 Estimate the strength of the given sample of $KMnO_4$ Solution in g/lit. Prepare a standard solution of N/10 Mohr's salt or N/10 Sodium Oxalate solution

4 Estimate volumetrically the strength of Ferrous and ferric ion in the given solution provided N/10 $KMnO_4$ Solution

5 Determine the strength in g/lit of each of HCl and HNO_3 present together in the given solution. Provided N/10 NaOH and N/20 $AgNO_3$

6 Determination of Nickel using murexide as an indicator (Direct method)

7 Prepare standard solution of Zn ion standardize the give EDTA solution and estimate the amount of unknown Zn ion concentration

8 To determine the total, permanent and temporary hardness of water by complexometric method using EDTA.

B. Sc. Second Year: Semester- III &IV

CCCP III (CCC III & IV, Section B)

Practical based on P-VII & P-IX

Laboratory Course- Paper-XI

Credits:02 **Periods: 120**

Note: At least sixteen experiments should be taken.

Part I (Physical Chemistry)

Instrumental :

1. Determine the normality and strength of strong acid (HCl / H_2SO_4 / HNO_3) onductometrically using standard solution of strong base (NaOH / KOH).

2. Determine the normality and strength of weak acid (CH_3COOH / HCOOH) conductometrically using standard solution of strong base (NaOH / KOH).

3. To determine the solubility of a sparingly soluble salts ($BaSO_4$ / $PbSO_4$ / AgCl) conductometrically at room temperature.

4. Determine the normality and strength of strong acid (HCl / H_2SO_4 / HNO_3) potentiometrically using standard solution of strong base (NaOH / KOH).

5. Determine redox potential of Fe^{3+} / Fe^{2+} / or Sn^{4+}/Sn^{3+} or Ce^{4+} / Ce^{3+} system by titrating it with standard $K_2Cr_2O_7$ / $KMnO_4$ potentiometrically

6. Verification of Lamberts-Beer's law using $KMnO_4$ / $NiSO_4$ / $K_2Cr_2O_7$ / $CuSO_4$ colorimetrically and determine concentration of unknown solution.

7. Determine the concentration of Cu^{++} ion in given solution, titrating it against std. EDTA solution

by colorimetric measurement.

8. To determine the hydrolysis constant of anilinehydrocloride by pH measurement.

Non-Instrumental

1. To study the effect of addition of electrolyte (KCl / NaCl) on solubility of weak organic acid at room temperature.

2. Determine energy of activation of reaction between KI and $K_2S_2O_8$.

3. Determine the parachor of p-dichloro benzene by stalgmometer method.

4. To determine the composition of the given mixture consisting of two miscible liquids, A & B by

viscosity measurement.

5. Determine partition coefficient of iodine between carbon tetrachloride and water.

6. Determine the solubility of benzoic acid in water at different temperatures and hence its heat of

solution.

7. To study the effect of solute (NaCl / Succinic acid) on the CST of phenol- water system and hence

determine amount of solute in given sample of phenol – water composition.

8. To find out the enthalpy of neutralization of weak acid/weak base against strong base/strong acid

and determine the enthalpy of ionization of weak acid/ weak base.

9. To study the kinetics of dissolution of magnesium metal in dil.HCl

10. To study the kinetics of decomposition of sodium thiosulphate by a mineral acid

Part II (Inorganic Chemistry)

Separation of binary mixtures and estimation of any one by volumetric method:

1. $Cu^{++} + Zn^{++}$

2. $Ba^{++} + Ca^{++}$

3. $Mn^{++} + Zn^{++}$

4. $Fe^{++} + Al^{+++}$

Reference books:

1 Text book on practical Chemistry, by K. S. Mukherjee

2 Laboratory Manual of Organic chemistry Raj. K. Bansal.

3 Advanced practical organic chemistry, by: Vishnoi.

4 Experimental organic chemistry by: Sing.

5 Experimental Physical Chemistry by A. Findlay. Longman.

6 Advanced Practical Physical Chemistry by J.B. Yadav. (Goel Publishing house, Meerut).

7 Experiments in Physical Chemistry by R. C. Das and B. Behra. Tata Mc Graw Hill.

8 Advanced experimental Chemistry Vol. I. Physical by J. N. Gurtu and R. Kapoor. S. Chand & Co.

9 Experiments in Physical Chemistry by J. C. Ghosh, Bharati Bhavan.

10 Practical book of Physical Chemistry – by Nadkarni Kothari & Lawande. Bombay Popular

Prakashan.

12 Systematic Experimental Physical Chemistry – by S. W. Rajbhoj, Chondhekar. Anjali Publication.

13 Practical Physical Chemisty – by B. D. Khosala & V. C. Garg. R. Chand & Sons.

14 Experiments in Chemistry by D. V. Jagirdar.

15 Practical Chemistry, Physical – Inorganic – Organic and Viva – voce by Balwant Rai Satija. Allied

Publishers Pvt. Ltd.

16 College Practical Chemistry by H. N. Patel, S. R. Jakali, H. P. Subhedar, Miss. S. P. Turakhia.

Himalaya Publishing House, Mumbai.

17 College Practical Chemistry by Patel, Jakali, Mohandas, Israney, Turakhia. Himalaya Publishing

Housing, Mumbai.

18 Experimental Physical Chemistry by A. Findlay. Longman.

19 Practical chemistry (For B.Sc.I, II, III year) by O. P.Pandey, D.N. Bajpai, S. Giri, S. Chand & Co.

20 University practical chemistry by P. C. Kamboj , Vishal publishing co.

21 Advanced Practical Inorganic Chemistry by Gurdeep Raj. (Goel Publishing house, Meerut).

22 Advanced Practical Organic Chemistry by Dr O. P.Agarwal. (Goel Publishing house, Meerut).

Swami Ramanand Teerth Marathwada University Nanded

Choice Based Credit System (CBCS) Course Structure
B. Sc. second year (Semester- III)
Semester Pattern effective from June -2017
Chemistry

Skill Enhancement Course SECC-I (A)

Food Processing And Food Adulteration: 02 Credits

Unit I Food Processing: 15 periods

1.1) Introduction, common food processing techniques : mincing, macerating, cooking, baking, boiling blanching, double steaming, frying, roasting.

1.2) Food processing an Indian prospective : Policy initiatives, Opportunities, Indian food processing industry, Research methodology, Analysis methods.

Unit II Food Preservation : 20 periods

1.3) Basic principles of food preservation- drying ,canning, pickling smoking packing.

1.4) Food preserving through Irradiation : Food irradiation, Radurization, Radicidation, Radappertization . Technologies : electron beam irradiation, Gamma radiation , x-ray radiation

1.5) Modern methods of food Preservation : Freeze drying, sodium benzoate , mechanism of food preservation, saccharin, saccharin and cancer.

1.6) Role preservatives in food processing : Phenylphenol, benzethonium chloride , calcium benzoate, sodium benzoate, calcium tartrate, dimethyl dicarbonate, ethylparaben, glycolic acid, hexamine.

Unit III Food adulteration: 10 periods

1.7) Detection of common food adulterants in : Spices, grains, oils, milk and milk products , food colors, tea , coffee.

Reference books

1) Food Preservation ---M.K.Singh (discovery publishing house Daryagang ,New delhi)
2) Food Science ----Shalini Pathak (Sonali Publications, Daryagang ,New delhi)
3) Food Processing --- M.K.Singh (discovery publishing house Daryagang ,New delhi)
4) Hand book of analysis and quality control for fruit and vegetable products : ---- S.Ranganna II edition
5) Milk and milk products ---- S.Mahindra –APH Publishing house Daryagang ,New delhi
6) Food Microbiology -----W.C.Frazier/D.C.Westhoff –Tata mcgraw hill
7) Food Chemistry -----Shalini Saxena --Raga publication Daryagang ,New delhi
8) Rapid detection of food adulterants and contaminants ----Shyam Zha
9) Handbook of adulteration and safety --- Sumeet Malik

Swami Ramanand Teerth Marathwada University Nanded

Choice Based Credit System (CBCS) Course Structure
B. Sc. second year (Semester- III)
Semester Pattern effective from June -2017
Chemistry

Skill Enhancement Course SECC-II (B)

PREPARATION OF SOLUTION AND ITS STANDARDIZATION

Unit I. Introduction: 10 periods

1.1 Solute, solvent, solution, types of solutions, Homogeneous solution, Heterogeneous solution.

1.2 Concentration of solution, dilute solution, standard solution.

Unit II. Ways of expressing the concentration of solutions and their preparation. 10 periods

1.3

Percentage by mass	(% w/W)
Percentage by volume	(% v/V)
Mole fraction	(x)
Molarity	(M)
Molality	(m)
Normality	(N)
Parts per million	(Ppm)
Parts per thousand	(Ppt)

Unit III. Preparation of standard solutions 13 periods

1.4 Preparation of any standard solutions from stock solution.

1.5 **Numerical**.

(a) Molarity, Molality, Normality, Mole fraction, ppm, ppt.

(b) Determination of concentration of mixing different concentrations and volume of same solution.

(c) Determination of compostions of mixture in terms of mole fraction.

Unit IV. Standardisation of solutions 12 periods

1.6 Standardisation of $KMnO_4$ solution.
Standardistion of HCl solution.
Standardisation of NaOH solution.
Standardisation of EDTA solution.
Standardisation of $K_2Cr_2O_7$ solution.

Reference books

1. Advanced practical of physical chemistry,
   Gurudeep Raj – Goel Publishing, House.

2. Advanced practical of inorganic chemistry
   Gurudeep Raj – Goel Publishing, House.

3. Systematic Experimantal physical chemistry.
   S.W. Rajbhoj, Dr. T.K. Chondhekar,
   Anjali Publication Aurangabad.

4. Essentials of physical chemistry,
   Arun Bahl, B.S. Bahl, G.D. Tuli(S.chand)

5. Practical chemistry by Dr. O.P. Pandey
   D.N. Bajpai, Dr. S. Giri (S.Chand)

6. Advanced practical physical chemistry,

   J.B. Yadav, Goel Publishing, House.

7. Advanced practical inorganic chemistry,

   O.P. Agrawal.

8. A Text book of practical chemistry for B.Sc,

   V.V. Nadkarny, A.N. Kothare and Y.V. Lawande.