

SHIVAJI UNIVERSITY, KOLHAPUR.



Accredited By NAAC with 'A' Grade

**Revised Syllabus For
Bachelor of Science**

**Part-II
Chemistry
CBCS PATTERN**

Syllabus to be implemented from

June, 2019 onwards.

B.Sc.Part II (CBCS) Sem III

Paper No. DSC- C3 - Chemistry paper No. V (Physical Chemistry)

(Theory Credits: 02 : 30 hours, 38 lectures)

Name of the Topics	Expected Learning Outcome
1 Electrolytic Conductivity	Learning and understanding conductivity and transport number of the aqueous solutions with different applications.
2 Physical Properties of Liquids	Knowledge about surface tension, viscosity and refractive index will be gained by the student
3 Surface Chemistry	Learning and understanding surface phenomena at heterogeneous surfaces
4 Nuclear Chemistry	Learning the various Nuclear phenomena and measurement of nuclear radiations
5 Chemical Kinetics	Learning and understanding the knowledge about third order reaction and theories of reaction rates

Unit- I Electrolytic Conductivity

(16L)

Introduction, Types of conductors, Conductivity, Equivalent and Molar conductivity and their variation with dilution for weak and strong electrolytes in aqueous solution. Equivalent conductivity at infinite dilution, Measurement of conductance by using Wheatstone bridge. Kohlrausch law of independent migration of ions and its applications such as Ionic mobility, determination of degree of ionization of weak electrolyte, solubility and solubility products of sparingly soluble salts, ionic product of water, hydrolysis constant of salt. Conductometric titrations (only acid base titrations). Advantages of conductometric titrations.

Transference number, Hittorf's rule, determination of transport number using Moving boundary method, factors affecting transport numbers. Numerical problems.

Unit- II Physical Properties of Liquids

(6L)

Introduction, Classification of physical properties, Surface tension and its determination using Stalagmometric and differential capillary rise methods, Viscosity and its determination using Ostwald's viscometer, Refractive index (Snell's law), Specific and Molecular refractivities and its determination using Abbe's refractometer.

Unit – III Surface Chemistry

(7L)

Introduction, Adsorption as a surface phenomenon, Definition of adsorption, adsorbent, adsorbate, adsorbent. factors affecting adsorption, Types of adsorption, Distinction between physical and chemical adsorption, Adsorption isotherms: Freundlich adsorption isotherm, Langmuir adsorption isotherm. Types of physical adsorption isotherms, applications of adsorption.

Unit – IV Nuclear Chemistry

(5L)

Introduction, Types of Nuclear radiation, properties of α , β and γ radiations, Detection and measurement of nuclear radiations by Scintillation and Geiger muller counter methods, radioactive equilibrium and range of α - particles, Geiger Nuttal relations, determination of radioactive constant (decay constant).

Introduction, Third order reactions: derivation of rate constant, characteristics and examples of third order reaction. Theories of reaction rates as Collision theory and Transition state theory (only quantitative aspect, derivation not expected),

Reference Books:

- 1) Barrow, G.M. Physical Chemistry Tata McGraw-Hill (2007).
- 2) Castellan G.W. Physical Chemistry 4th Ed. Narosa (2004).
- 3) Kotz, J.C. Treichel, P.M.& Townsend, J.R. General Chemistry, Cengage Learning India Pvt Ltd: New Delhi (2009).
- 4) Mahan, B.H. University Chemistry, 3rd Ed. Narosa (1998).
- 5) Petrucci, R.H. General Chemistry, 5th Ed., Macmillan Publishing Co.,: New York (1985).
- 6) Elements of Physical Chemistry S., Glasstone, D. Lewis.(2010)
- 7) Principles of physical Chemistry Marron and Prutton. (2007).
- 8) Elements of Physical Chemistry P.W. Atkins (2017)
- 9) Essentials of Physical Chemistry Bahl and Tuli. S. Chand, 2010.
- 10) Physical Chemistry Daniels and Alberty (2016)
- 11) University General Chemistry C.N.R. Rao (2016)
- 12) Principals of Physical Chemistry Puri, Sharma and Pathania 47th Edition, Vishal Publishing Co. Daryaganj Delhi. 110002 (2017)
- 13) Physical Chemistry A.J. Mee.(2015)
- 14) Advanced Physical Chemistry Gurudeep Raj (2017)
- 15) Physical Chemistry R.A. Alberty.(2017-18)
- 16) Petrucci, R.H. *General Chemistry* 5th Ed. Macmillan Publishing Co.: New York (1985).

B.Sc.Part II (CBCS) Sem III

Paper No. DSC-C4- Chemistry paper No. VI (Industrial Chemistry)

(Theory Credits: 02 : 30 hours, 38 lectures)

Expected learning Outcomes :

Name of the topic	Expected Learning Outcome
1.Basic concepts in Industrial Chemistry	a.Learning and Understanding basic concepts and concentration terms b.Distinguish between classical and industrial chemistry c. Distinguish between unit operations and unit processes
2. Unit Operations	Knowledge of some unit operations
3.Corrosion and Electroplating	Understanding the process of corrosion and Knowledge of prevention from corrosion
4.Paper Industry	Knowledge of Indian paper industry
5.Soap and Detergents	Knowledge about the chemical nature and cleansing action of soap

Unit I Basic Concepts in Industrial Chemistry(10)

The difference between classical chemistry and industrial chemistry, Raw material for the Chemical Industry,Material Safety data sheets,Units that make up a chemical process-unit operation and unit processes, Flow Diagrams,Block Diagram, Process flow diagram / flow sheets, Material Balances-The purpose of mass balance calculations,Material Balance Equations,Mass balance calculation procedure and simple example

Definition and Explanation of terms -Normality, Equivalent weight, Molality, Molecular weight,Molarity, Molarity of mixed solution, Acidity of base, Basicity of acid,ppt, ppm, ppb solutions, Mole Fraction, Weight fraction, Percentagecomposition by W/W, W/V, V/V, Problems based on Normality, Molarity, mole fraction, mixed solution, etc.

Unit II Unit Operations(06)

Size reduction- Principle,Jaw crusher,ball mill

Size Enlargement –Principle,Pellet mill,tumbling agglomerators

Separation – Magnetic separation,Froth flotation,Distillation-Distillation of liquid mixtures, Types of distillation, Types of columns and packings, Condensers, Vacuum distillation, Spinning-banddistillation, Steam distillation.

Unit III. Corrosion and Electroplating (09)

Introduction of corrosion, Electrochemical theory of corrosion,Factors affecting on corrosion -i. Position of metals in the electrochemical series on the basis of standard reduction potential ii. Purity of metal iii. Effect of moisture iv. Effect of oxygen (differential aeration principle) v. Hydrogen overvoltage, Methods of protections of metals from corrosion, Electroplating: Electrolysis, Faraday's laws, Cathode current Efficiency, Basic principles of electroplating, Cleaning of articles, Electroplating of chromium, Anodising

Unit IV Paper Industry (06)

Manufacturing of Pulp,Types of pulp-Sulphate and soda ,Manufacturing of paper, calendaring ,ecological problems of Indian Paper industry, Features of good paper industry

Unit V Soaps and Detergents (07)

Introduction, Soaps - Raw materials, Types of soaps, Cleansing action of soap, Manufacture of soap - Boiled or Hot Process, Detergents - Raw Materials, Types of Detergents: Anionic, cationic and amphoteric, Preparation of Teepol and Deriphath, Comparisons between soaps and detergents.

Reference Books:

- 1) Principles of Physical Chemistry by Puri, Sharma and Pathania, Vishal Publishing company Jalindhar
- 2) Essential of Physical Chemistry by Bahl B.S., Tuli G.D. and Bahl Arun, S.Chand and Company Ltd. New Delhi
- 3) Modern Analytical Chemistry By David Harvey, McGRAW-Hill International Edition, 2000
- 4) Industrial chemistry by B.K.Sharma, Goel Publishing Housing, 16th edition 2011
- 5) Advanced Inorganic Chemistry, Vol.No.1, by Gurudeep Raj, Krishna Prakashan Media Ltd, Goel Publication, Meerut
- 6) Analytical chemistry by B.K.Sharma, Krishna Prakashan Media Ltd, Meerut, edition 3rd 2011
- 7) Principles of electroplating and electroforming by Blum and Hogaboom
- 8) Chemical Process Industries by Shreve and Brink
- 9) Industrial Chemistry by Loutfy Madkor and Helen Njenga
- 10) Elementary Principles of Chemical Processes by Richard Felder and Ronald Rousseau, John Wiley and Sons

B.Sc.Part II (CBCS) Sem IV

Paper No. DSC-D3- Chemistry paper No. VII (Industrial Chemistry)

(Theory Credits: 02 : 30 hours, 38 lectures)

Expected learning Outcomes :

Name of the topic	Expected Learning Outcome
1.Co-ordination Chemistry	.Learning and Understanding basic concepts about coordination complexes
2. Chelation	Knowledge about application of chelates in analytical chemistry.
3. P- Block elements	Understanding the properties of P – block elements
4. Chemistry of elements of 3d series elements	Student will be capable of understanding the properties of 3d series elements
5 Inorganic semi-micro qualitative analysis	Student will learn the basic knowledge about the qualitative analysis of inorganic compounds

Unit 1: Co-ordination chemistry

(10)

- 1.1 Introduction-Definition and formation of co-ordinate covalent bond in $\text{BF}_3 - \text{NH}_3$, $[\text{NH}_4]^+$ and H_2O
- 1.2 Distinguish between double salt and complex salt
- 1.3 Werner's theory-
 - 1.3.1. Postulates
 - 1.3.2. The theory as applied to cobalt amines viz. $\text{CoCl}_3.6\text{NH}_3$, $\text{CoCl}_3.5\text{NH}_3$, $\text{CoCl}_3.4\text{NH}_3$, $\text{CoCl}_3.3\text{NH}_3$
- 1.4 Description of the terms- ligand, co-ordination number, co-ordination sphere, Effective atomic number
- 1.5 IUPAC nomenclature of coordination compounds.
- 1.6 Isomerism in complexes with C.N. 4 and 6
 - 1.6.1 Geometrical Isomerism
 - 1.6.2 Optical Isomerism
 - 1.6.3 Structural Isomerism-Ionisation Isomerism, Hydrate Isomerism, Coordination Isomerism, Linkage Isomerism and Co-ordination position Isomerism
- 1.7 Valance bond theory of transition metal complex with respect to, C.N. 4, complexes of Cu and Ni
C.N. 6 complexes of Fe and Co

Unit 2: Chelation

(05)

- 2.1 A brief introduction with respect to ligands, chelating agent, chelation and metal chelates.
- 2.2 Structural requirements of chelate formation
- 2.3 Difference between metal chelate and metal complex
- 2.4 Classification of chelating agents (with specific illustration of bidentate chelating agents)
- 2.5 Application of chelation with respect to chelating agents - EDTA and DMG

Unit-3. P- Block elements (Group 13, 14 and 15)

(09)

- 3.1. Position of elements in periodic table
- 3.2. Characteristics of p-block elements with special reference to Electronic configuration and Periodic properties
- 3.3. Compounds of group 13,14 and 15
 - 3.3.1 Boron-Diborane method of preparation and nature of bonding (structure)
 - 3.3.2 Borazine method of preparation and nature of bonding (structure)
 - 3.3.3 Allotropes of carbon and phosphorus
 - 3.3.4 Oxyacids of nitrogen – HNO_2 , HNO_3 .
 - 3.3.5 Hydrides of Nitrogen- NH_3 and N_2H_4

Unit 4: Chemistry of elements of 3d series elements

(06)

- 4.1 Position of elements in periodic table
- 4.2 Characteristics of d-block elements with special reference to
 - i) Electronic structure
 - ii) Oxidation states, stability of oxidation states of Fe with respect to Latimer diagram
 - iii) Magnetic character
 - iv) Colored ions
 - v) Complex formation.

Unit-5. Inorganic semi-micro qualitative analysis

(08)

- 5.1 Theoretical principles involved in qualitative analysis.
- 5.2 Applications of solubility product and common ion effect in separation of cations into groups.
- 5.3 Application of complex formation in
 - a) Separation of II group into IIA and IIB sub-groups.
 - b) Separation of Copper from Cadmium.
 - c) Separation of Cobalt from Nickel.
 - d) Separation of Cl^- , Br^- , I^- .
 - e) Detection of NO_2^- , NO_3^- (Brown ring test).
- 5.4 Application of oxidation and reduction in
 - a) Separation of Cl^- , Br^- , I^- in mixture
 - b) Separation of NO_2^- and NO_3^- in mixture.
- 5.5 Spot test analysis.

Reference Books :

1. Inorganic chemistry, Principles of structure and reactivity by J.E. Huheey and etal
2. Inorganic Chemistry by Shriver and Atkins 5th edition
3. Vogels text book of Qualitative Inorganic analysis by A. I. Vogel .3rd and 6th edition
4. Advanced Inorganic Chemistry by Agrawal Keemtilal (Pragati Prakashan)
- 5 Theoretical Inorganic chemistry by C.Day & J.Selbin IInd edition
6. Principles of inorganic chemistry by Puri Sharma & Kalia
7. Modern Inorganic chemistry by R.D.Madan (S.Chand)
8. Inorganic Chemistry by J.D.Lee
9. Basic Inorganic Chemistry by F.A.Cotton,G.Wilkilson & B.L.Gaus wiley
10. Chemistry for Degree students by R.L.Madan (S.Chand Publication)

B.Sc.Part II (CBCS) Sem IV

Paper No. DSC- D4 - Chemistry paper No. VIII (Organic Chemistry)

(Theory Credits: 02 : 30 hours, 38 lectures)

Expected learning Outcomes :

Name of the topic	Expected Learning Outcome
Carboxylic acids and their derivatives.	To impart knowledge about the synthesis, reactivity and applications of carboxylic acids.
Amines and Diazonium Salts	Knowledge about classification, preparation and applications of amines and diazonium salts.
Carbohydrates	Understanding the classification, configuration and structure of carbohydrates.
Carbonyl Compounds- Aldehydes and Ketone	Student will be capable of understanding the nomenclature and reactivity of aldehydes and ketones.
Stereochemistry	Student will learn the basic knowledge conformational analysis of organic compounds

Unit 1: Carboxylic acids and their derivatives.

[8L]

1.1 Monocarboxylic acid: Introduction, Methods of Formation from Alcohols, Aldehydes, Ketones, Nitriles and Alkyl benzenes.

Chemical Reaction: Hell-Vohlard-Zelinsky (HVZ) reaction.

1.2 Formation of Halo Acids, Mono, Di, Tri- chloro acetic acid.

Substitution reaction of Monochloro acetic acid by Nucleophile OH^- , I^- , CN^- and NH_3

1.3 Hydroxy acids: Malic and Citric acid

Methods of formation of Malic acid from maleic acid, from Alpha bromo succinic acid and moist Ag_2O .

Chemical Reactions: Reactions of Malic acid- Action of heat, oxidation by KMnO_4 and reduction reaction with HI .

Uses of Malic acid

Method of formation of Citric acid from glycerol.

Chemical Reactions: Reaction of citric acid: acetylation by acetic anhydride, reduction by HI , action of heat.

Uses of citric acid.

1.4 Unsaturated acid: Cinnamic acid: method of formation from benzaldehyde using diethyl malonate and by using acetic anhydride and sodium acetate.

Chemical Reactions- Bromination, Oxidation. Uses of cinnamic acid

Acrylic acid: Method of formation from acrolein and by dehydration of beta hydroxy propionic acid.

Chemical Reactions: Addition of water, Reduction by $\text{Na}/\text{C}_2\text{H}_5\text{OH}$. Uses of acrylic acid.

1.5 Dicarboxylic acid: Succinic and phthalic acid

Method of formation of succinic acid from ethylene dibromide, maleic acid

Chemical Reactions: Action of heat, Action of NaHCO_3 , $\text{C}_2\text{H}_5\text{OH}$ in presence of acid.

Uses of succinic acid.

Phthalic acid: Method of formation from o-xylene and Naphthalene

Chemical Reactions: Action of heat, reaction with sodalime, ammonia, uses of phthalic acid.

1.6 Carboxylic acid derivatives: Introduction

Acid halide derivative: Acetyl chloride: formation from acid, by action with PCl_3 and SOCl_2 , reaction with water, alcohol (Mechanism of esterification is expected) and ammonia.

Uses of acetyl chloride.

Acid anhydride derivative: Method of formation of acetic anhydride by dehydration of acetic acid, reactions with water, alcohol and ammonia, uses of acetic anhydride.

Unit 2: Amines and Diazonium Salts:

[8L]

2.1 Introduction, Classification, Nomenclature, structure.

2.2 Methods of preparation: a) From Alkyl halide by Amolysis, b) By Reduction of Nitriles or Cyanides, c) From Unsubstituted amides (Hoffmann degradation), d) By Gabriel Synthesis (From Phthalamide).

2.3 Reactions: Carbylamine reaction, Schotten-Baumann reaction, Electrophilic substitution (Aniline), Nitration, Bromination, Sulphonation.

2.4 Diazonium salt: Introduction, Preparation of Benzene diazonium chloride.

2.5 Reactions: Replacement by Halogen (Sandmeyer), Replacement by Iodine, Replacement by $-\text{OH}$, C and N Coupling reactions: Synthesis of Methyl orange and Congo red. Reduction of BDC.

Unit 3: Carbohydrates

[8L]

Classification of carbohydrates, reducing and non-reducing sugars, General properties of glucose and fructose, their open chain structure. Epimers, mutarotation and anomers.

Determination of configuration of Glucose (Fischer proof). Ring structure of glucose Determination of size of the ring of Glucose by methylation method.. Haworth projections. Cyclic structure of fructose. Linkage between monosachharides, structure of disacharrides (sucrose, maltose, lactose) and polysacharrides (starch and cellulose) excluding their structure elucidation.

Unit 4: Carbonyl Compounds- Aldehydes and Ketone

[6L]

4.1 Introduction, Nomenclature, structure.

4.2 Reactivity of Carbonyl group, mechanism of Nucleophilic addition to Carbonyl group

4.3 Reactions: mechanism and application of Aldol condensation, Perkin reaction, Cannizaros reaction, Knoevenagel condensation, *Reformatsky* reaction.

Unit 5: Stereochemistry

[8L]

5.1 Conformational isomerism – Introduction.

5.2 Representation of conformations of ethane by using Saw- Horse, Fischer (dotted line wedge) and Newmann's projection formulae.

5.3 Conformations and conformational analysis of ethane and n-butane by Newmann's Projection formula with the help of energy profile diagrams.

5.4 Cycloalkanes relative stability - Baeyer's strain theory, Theory of strainless rings.

5.5 Conformations and stability of cyclohexane and monosubstituted cyclohexanes Cyclohexanol, bromocyclohexane and methyl cyclohexane.

5.6 Locking of conformation in t-butyl cyclohexane.

Reference Books:

1. Morrison, R. T. & Boyd, R. N. *Organic Chemistry*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).

2. Stereochemistry conformation & Mechanism, 9th Edition, By P.S.Kalasi, Publisher: New Age International, 2017

3. Stereochemistry of carbon compounds by Eliel..

4. Stereochemistry of Organic Compounds by D. Nasipuri.

5. Finar, I. L. *Organic Chemistry (Volume 1)*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).

6. Finar, I. L. *Organic Chemistry (Volume 2)*, Dorling Kindersley (India) Pvt. Ltd.

7. Organic Chemistry. Volume I, II, III by S.M. Mukharjee, S.P. Singh and R.P. Kapoor. Wiley Eastern Limited (New Age International)

8. Advanced Organic Chemistry by, B.S. Bahl, ArunBahl. S.Chand & Company, Ltd.

9. Chemistry by R.L.Madan, S.Chand and Company Ltd.

B. Sc II Practical Course
Total Marks 100
(Credits: 04)

Inorganic Chemistry (Marks 35)

1) Gravimetric Analysis (Any two)

- i) Gravimetric estimation of iron as Fe_2O_3 from a solution containing Ferrous ammonium sulphate and free sulphuric acid.
- ii) Gravimetric estimation of barium as BaSO_4 from a solution containing barium chloride and free hydrochloric acid.
- iii) Gravimetric estimation of nickel as $\text{Ni}(\text{DMG})_2$ from a solution containing $\text{NiSO}_4 \cdot 7\text{H}_2\text{O}$ and free sulphuric acid
- IV) Gravimetric estimation of aluminium as Aluminium oxinate from a solution containing aluminium sulphate or potash alum and free sulphuric acid.

2) Inorganic Preparations (Any two)

- i) Preparations of sodium cuprous thiosulphate
- ii) Preparation of tris (ethylene diamine) nickel (II) thiosulphate
- iii) Preparation of hexammine nickel (II) chloride

3) Titrimetric Analysis (Any four)

(Calibration of burette, pipette and volumetric flask is essential)

- i) Fertilizer analysis : To determine percentage of nitrogen in the given sample of a nitrogenous fertilizer (ammonium sulphate). Known weight of the sample to be taken by the student. For preparing its solution which is to be refluxed with known excess of alkali. Standard HCl solution to be supplied.
- ii) Analysis of Synthetic /Commercial Sample : To estimate Magnesium from talcum powder.
- iii) Determination of total hardness of water using 0.01M EDTA solution.
(Students should standardize the given EDTA solution by preparing 0.01M CaCl_2 solution. using CaCO_3 salt.)
- iv) Determination of alkali content from antacid tablet using HCl solution .
- v) Vinegar Analysis : To estimate amount of acetic acid from vinegar sample
- Vi) Estimation of Calcium from chalk : To estimate amount of calcium from the chalk by titrimetric method. (By redox titration using KMnO_4 solution)
(Note : These experiments are performed by preparing calibrated sets of burettes, pipettes and volumetric flasks.)

4) Semi-micro qualitative analysis

Analysis of binary mixtures with non interfering cations and anions (at least 6 mixtures to be analyzed)

i) Following anions are to be given :

Cl^- , Br^- , I^- , NO_3^- , CO_3^{2-} , SO_4^{2-} , S^{2-} , BO_3^{3-} (insoluble CO_3^{2-} , S^{2-} , BO_3^{3-} may be given)

ii) Following cations are to be given :

Cu^{+2} , Cd^{2+}

Al^{+3} , Fe^{+3} , Cr^{+3} .

Zn^{+2} , Mn^{+2} , Ni^{+2} , Co^{+2} .

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

Mg^{+2} .

NH_4^+ , K^+

Note:-Use of spot tests to be made whenever possible.

Reference Books:

1. Vogel's text book of Qualitative Inorganic analysis by A. I. Vogel .3rd and 6th edition
2. Vogel's text book of Quantitative Inorganic Chemistry by A. I. Vogel.
3. Physical Chemistry of Inorganic qualitative analysis by Kuricose & Rajaram.
4. Practical manual in water Analysis by Goyal & Trivedi.

5. Basic Concepts in Analytical Chemistry by S. M. Khopkar. Wiley Eastern Ltd.
6. Practical Chemistry, Physical , Inorganic , Organic and Viva voce by Balwant Rai Satija. Allied Publishers Private Limited.
7. College Practical Chemistry by H. N. Patel, S. R. Jakali, H. P. Subhedar, Miss. S. P. Turakhia. Himalaya Publishing House, Mumbai.
8. College Practical Chemistry by Patel, Jakali, Mohandas, Israney, Turakhia.

Organic Chemistry Practical's (Marks 30)

A) Organic Qualitative Analysis

Identification of at least **Eight** Organic compounds with reactions including two from acids, two from phenols, two from bases and two from neutrals.

Acids – Succinic acid, Phthalic acid, Salicylic acid, Aspirin.

Phenols – Alpha-Naphthol, o-nitrophenol, p-nitrophenol.

Bases – o-,m- and p-nitroanilines, Diphenyl amine.

Neutrals – Urea, Acetanilide, Carbon tetrachloride, Bromobenzene, Methyl acetate, Nitrobenzene, Naphthalene, Anthracene, Acetophenone, Ethyl methyl ketone.

Note : A systematic study of an organic substance involves reactions in the determination of elements and functional group.

B) Organic Quantitative Analysis

I) Estimations

- 1) Estimation of ester.
- 2) Estimation of acetone.
- 3) Estimation of vitamin C.

II) Organic preparations

- 1) p-nitro acetanilide from acetanilide.
- 2) Acetanilide from aniline using anhydrous $ZnCl_2$ and Zn dust.
- 3) Phthalimide from phthalic anhydride.
- 4) Benzoic acid from benzamide.

iii) **Demonstration of Thin layer chromatography.** Separation, identification and determination of R_f values

Reference Books :

1. Practical Organic Chemistry by A.I. Vogel.
2. Hand book of Organic qualitative analysis by H.T. Clarke.
3. A Laboratory Hand Book of Organic qualitative analysis and separation by V.S. Kulkarni. Dastane Ramchandra & Co.
4. Practical Organic Chemistry by F.G. Mann and B.C. Saunders. Low – priced Text Book. ELBS. Longman
5. Advanced Practical Organic Chemistry by N.K. Vishnoi. Vikas Publishing House Private Limited.
6. Advanced practical chemistry by J. Singh, L. D. S. Yadav, R. K. P. Singh, I. R. Siddiqui et.al, Pragati prakashan.

Practicals Physical chemistry (Marks 25 + Journal 10)

- 1) To study the hydrolysis of methyl acetate in presence of HCl and H_2SO_4 and to determine the relative strength of acids.
- 2) To study the effect of acid strength on hydrolysis of an ester by using 0.5M HCl and 0.25M HCl.
- 3) To study the reaction between potassium persulphate and potassium iodide in solution with equal concentration of the reactants.
- 4) To study the reaction between potassium persulphate and potassium iodide in solution with unequal concentration of the reactants.
- 5) To determine the degree of dissociation and dissociation constant of acetic acid at various dilutions and to verify Ostwald's dilution law conductmetrically.
- 6) To determine the normality of the given strong acid by titrating it against the strong alkali conduct metrically.
- 7) To determine the normality of the given weak acid by titrating it against the strong alkali conductometrically.
- 8) To determine the percentage composition of a given liquid mixture by viscosity method (Density data to be given).

- 9) To determine the specific and molar refractions of benzene, toluene and xylene by Abbe's Refractometer and to determine the refraction of CH₂ Group (Methylene group) (Densities should be determined by students).
- 10) To determine the specific rotation and unknown concentration of sugar solution.

Reference Books: -

- 1) Mendham, J.Vogel's Quantitative Chemical Analysis, Pearson 2009.
- 2) Khosla,B.D.; Garg, V.C. &Gulati, A. Senior Practical Physical Chemistry, R. Chand & Co: New Delhi (2011).
- 3) Findlay' Practical Physical Chemistry (Longmann) 2015.
- 4) Practical Physical Chemistry: Gurtu (S. Chand) 2014.
- 5) Systematic Experimental Physical Chemistry: Rajbhoj, Chandekar (Anajali Publication) 2016.
- 6) Advanced Practical Physical Chemistry: J.B.Yadav (Goel Publishing House) 2015.

**B.Sc. II Revised Syllabus 2018-19
Sem.III & IV Nature of Question paper
Total Marks 50**

- Q.1 a. Answer the following in one sentence. 5**
- i)
 - ii)
 - iii)
 - IV)
 - V)
- b. Choose the correct alternative and rewrite the sentence again 5**
- I)
 - II)
 - III)
 - IV)
 - V)
- Q.2. Attempt any TWO of the following (Out of FOUR) 20**
- a)
 - b)
 - c)
 - d)
- Q.3. Answer any FOUR of the following (Out of SIX) 20**
- a)
 - b)
 - c)
 - d)

e)
f)