Swami Ramanand Teerth Marathwada University, Nanded

B. O. S. In Chemistry

B. Sc. First Year (Chemistry) Semester-I & II

New Revised
In force from June - 2011

B. Sc. First Year (Semester-I)
Chemistry

Paper No.	Course	Periods/week	Total Periods	Marks
I	Organic Chemistry + Inorganic Chemistry	3	45	50
II	Physical Chemistry + Inorganic Chemistry	3	45	50

B. Sc. First Year (Semester-II)
Chemistry

Paper No.	Course	Periods/week	Total Periods	Marks
III	Organic Chemistry + Inorganic Chemistry	03	45	50
IV	Physical Chemistry + Inorganic Chemistry	03	45	50
V	Laboratory Course-I	04	120	100

The distribution of marks is as follows:

Semester	Papers	Course	MCQ	Internal Assessment	Total
Semester-I	Paper-I	Organic + Inorganic Chemistry	40	10	50
	Paper-II	Physical + Inorganic Chemistry	40	10	50
Semester-II	Paper-III	Organic + Inorganic Chemistry	40	10	50
	Paper-IV	Physical + Inorganic Chemistry	40	10	50
	Paper-V	Laboratory Course-I	-	-	100

B. Sc. First Year (Semester-I)
Paper-I, Organic + Inorganic Chemistry [CH-101]

Marks: 50 **Periods: 45**

Unit-I

1.1 IUPAC Nomenclature of Organic Compounds: **03**

Nomenclature of Alkanes, Cyclo-alkanes, Alkenes, Dienes, Alkynes, Alkyl halides, Alcohols, Ethers, Carbonyl compounds, Carboxylic acids, Esters, Amines, Benzene derivatives.

1.2 Mechanism of Organic Reactions: **07**

a. Substrate and Reagents.
b. Types of reagents: Electrophilic and nucleophilic
c. Homolytic and heterolytic fission
d. Electron mobility: Inductive effect, Resonance, Hyperconjugation (with one example each)
e. Study of reaction intermediates; Carbocations, carbanions, free radicals, carbenes Nitrenes, arynes.
f. Types of reaction:
   a) Substitution
   b) Addition
   c) Elimination.
   d) Rearrangement.

Unit-II

Alkenes, Dienes and Alkynes: **10**

2.1 *Alkenes:*

a) Preparation of alkenes
   a) 1-Butene from n-butyl chloride and sec. Butyl chloride.
   b) 2-Butene from n-butyl alcohol and sec. Butyl alcohol.

b) Chemical Properties of alkenes (with mechanism)
   a) Electrophilic and free radical addition of HBr to ethene and propene.
   b) Electrophilic addition of Br_2 to ethene.
   c) Reaction of propene with Cl_2/ H_2O (Cyclohydrin formation)
   d) Oxymercuration-Demercuration reaction (Conversion of 3,3-dimethyl-1-butene to 3,3-dimethyl-2-butanol)
   e) Cis-hydroxylation using alkaline $KMnO_4$.

2.2 *Dienes:*
   a) Definition and classification of dienes.
   b) Resonance structure and molecular orbital picture of 1,3-butadiene
   c) Preparation of 1,3-butadiene from 1,4-dibromobutane and 1,4-butane diol.
   d) Chemical Reactions;
      1] 1,2 and 1,4 addition of Br_2 to 1,3-butadiene.
      2] 1,2 and 1,4 addition of HBr to 1,3-butadiene.
      3] Addition of ethane to 1,3-butadiene and to Maleic anhydride (Diel's-Alder reaction)

2.3 *Alkynes:*

a) Preparation of ethyne (Acetylene) from iodoform and methane

b) Chemical Reactions (With Mechanism):

a) Electrophilic addition of Br_2 to ethyne.

b) Electrophilic and free radical addition of HBr to ethyne.

c) Nucleophilic substitution reaction of acetic acid and hydrocynic acid.

Unit-III

Alcohol, Ethers and Epoxides **05**

3.1 **Alcohol:** Introduction and classification.

i) Dihydric alcohols:

Nomenclature, Methods of formations.

a) from alkenes: (hydroxylation)

b) from 1,2-dihaloalkanes.

Chemical reactions:

a) reaction with hydrogen chloride (HCl)

b) oxidation with lead tetra acetate [$Pb(OCOCH_3)$]

c) oxidation with per iodic acid (H_5IO_6)

d) dehydration of ethane-1,2-diol using P_2O_5 / $ZnCl_2$

ii) Trihydric alcohols:

Nomenclature, Methods of formations

a) From fats and oils

b) From propene

Chemical reactions;

a) reaction with nitric acid

b) reaction with hydroiodic acid

c) reaction with potassium hydrogen sulphate

d) reaction with acetyl chloride.

3.2 **Ethers:**

Introduction and classification.

Methods of formations

a) dehydration of alcohols

b) by Williamsons synthesis.

Physical properties, Chemical reactions;

a) action of HI

b) Autoxidation of ether

Ziesels methods for estimations of methoxy group

3.3 **Epoxides:**

Introduction and nomenclature, Methods of formations

a) Oxidation of ethene in the presence of silver catalyst

b) Oxidation of ethane with peracetic acid.

Chemical reactions:

Ring opening reaction of Epoxides: by acidic reagent, by basic reagent, reaction of epoxyethane with CH_3-Mg-I and CH_3-Li

Section-B

Unit-I

1.1 IUPAC Nomenclature of Inorganic Compounds: 05P

Nomenclature of molecules of single elements, Monoatomic cation, Other cations, Mono-atomic and Homopolyatomic anion, Hetero-polyatomic anion, Names of isopolyanions, condensed hetero-polyanions, Isopoly acids, Heteropoly acids, Names of neutral hydrides and names of boron hydrides.

1.2 Periodic Table and Periodic Properties: 10P

A] Periodic Table: Modern periodic law, Long form of the periodic table, Sketch, Structure, Cause of periodicity, Division of elements in to s, p, d, and f blocks. General characteristics of s, p, d, f, block elements.

B] Periodic properties:

a) Atomic and Ionic size: Definition and explanation of atomic radius, ionic radius, Covalent radius, Vander waals radius. Variation of atomic size along a period and in a group.

b) Ionization Energy: Definition and Explanation, Successive ionization energy, Factors affecting ionization energy. Variation of ionization energy along a period and in a group. Applications of ionization energy to chemical behavior of an element.

c) Electron Affinity: Definition and Explanation, Successive electron affinity, Factors affecting electron affinity. Variation of electron affinity along a period and in a group. Applications of electron affinity to chemical behavior of an element. Difference between ionization energy and electron affinity.

d) Electron Negativity: Definition and Explanation, Factors affecting electron negativity. Variation of electron negativity along a period and in a group. Pauling's approach of electron negativity. Calculations of electron negativity by Pauling's method. Applications of electron negativity to bond properties such as percent ionic character, bond length, bond angle.

Reference Books:

1. Organic Chemistry: Morrison and Boyd.
2. Organic Chemistry: Vol I & II by I. L. Finar.
3. Organic Chemistry: Pine.
4. Advanced Organic Chemistry: M. K. Jain.
5. Organic Chemistry: Vol. I, II, & III by S. P. Singh, Mukharji and Kapoor.
6. Advanced Organic Chemistry: B. S. Bhal and Arun Bhal.
7. A Guide book to mechanism on Organic Chemistry: Peter Sykes.
8. Text Book of organic Chemistry: P. L. Soni.
1. Principles of Inorganic chemistry by Puri, Sharma and Kalia.
2. Advanced inorganic chemistry by Gurudeep Raj and Chatwal Anand.
3. Concise Inorganic Chemistry by J. D. Lee.
4. Basic Inorganic Chemistry by F. A. Cotton, G. Wilkinson and P. L. Gaus.
5. Inorganic Chemistry by A. G. Sharp.
6. Inorganic Chemistry by G. L. Miessler and D. A. Tarr.

B. Sc. First Year (Semester-I)
Paper-II; CH-102
Physical + Inorganic Chemistry

Marks: 50 **Periods: 45**

Unit-I
Chemical Mathematics: **06P**
a) Logarithm: - Rules of logarithm, Characteristic and mantissa, Change of sign and base. Numerical problems.
b) Definition of pH and pOH. Relation between pH and POH, Numerical Problems based on pH and pOH.
c) Graphical representation of equations:- Rules for drawing graph coordinates etc., Equation of straight line, slope and intercept, plotting the graph from the data of chemical properties and Numerical Problems.
d) Derivative: - Rules of differentiation and partial differentiation, Algebraic, logarithmic and exponential functions.
e) Integration: - Rules of integration, Algebraic and exponential functions.
f) Permutation and combination, Numerical Problems.

Unit-II
General Concepts in Chemistry: **07P**
a) Definitions of the terms: Solute, solvent, solution, dilute solution and standard solution.
b) Concentration units: Normality, Molarity, Molality, Mole fraction, Weight fraction, Percentage composition by weight and by volume (Numerical).
c) Concentrations of Bulk Solutions used in Laboratory and preparation of standard solutions from them (HCl, H_2SO_4, HNO_3 and Ammonia). Numerical Problems using equation $n_1v_1=n_2v_2$ and $M_1V_1=M_2V_2$.

Unit-III
Gaseous State: **10P**
a) Kinetic molecular theory of gases: Postulates of kinetic theory of gases. Derivation of kinetic gas equation.
b) Behavior of real gases: Ideal and non- ideal gases. Deviation of gases from Ideal behavior, Compressibility factor (Z), Explanation of deviation-Van der waal's equation. Unit for Van der waal's constant. Interpretation of deviation from Van der Waal's equation.
c) Critical phenomenon-Andrew's isotherms of Carbon dioxide, application of Van der Waal's equation to the isotherms of Carbon dioxide, relation between critical constants and Van der Waal's constants .Numerical based on relation.
d) Molecular velocities-Root men square, average and most probable velocities. Numerical based on -Root men square velocities.

Unit-IV

Solid state: 0**7P**

a) Introduction, space lattice, Unit Cell.

b) Laws of crystallography: (i) Law of constancy of interfacial angles. (ii) Law of rational indices. (iii) Law of symmetry. symmetry elements in crystals.

c) Weiss indices and Miller indices. Determination of Miller indices. Numerical based on miller indices.

d) Cubic lattice and types of cubic lattice, planes or faces of a simple cubic system, spacing of lattice planes.

e) Diffraction of X-rays: Derivation of Bragg's equation.

f) Determination of crystal structure of NaCl and KCl on the basis of Bragg's equation.

Section-B

Unit-I

Chemical Bonding-I **10P**

1.1 Definition, Cause for chemical bonding, Types of chemical bonding.

1.2 *Ionic Bonding:* Definition and explanation, Factors affecting the formation of ionic bond, Energy charges in the formation of ionic bond, Lattice energy and Born-Haber cycle. Polarizing power and polarisability, Fajan's rule.

1.3 *Covalent bonding:* Definition and explanation, Sigma and pi-bond, Valence bond theory of covalent bonding and its limitations, Percentage ionic character in covalent bond from dipole moment and electronegativity difference (Numericals).

1.4 *Metallic bonding:* Definition and explanation, Free electron theory of metallic bonding, Effects of metallic bonding on metallic properties.

1.5 *Vander Waal's bonding:* Definition and explanation, Types of Vander Waal's forces responsible for Vander waals bonding.

1.6 *Hydrogen bonding:* Definition and explanation, Types of hydrogen bonding and consequences of hydrogen bonding. Unique properties of water based on hydrogen bonding. Importance of hydrogen bonding in sustaining life.

Unit-II

Chemical bonding-II **05P**

2.1 *Concept of hybridization:* Definition and explanation of dsp^2 hybridization by taking example of $[Ni(CN)_4]^{-2}$, d^2sp^3 hybridization by taking example PCl_5, d^2sp^3 hybridization by taking example SF_6. d^3sp^3 hybridization by taking example IF_7.

2.2 *VSEPR Theory:* Postulates and explanation, Applications in explaining geometry and bond angle in molecules such as CH_4, NH_3, and H_2O. Limitations of VSEPR theory.

2.3 *Molecular Orbital Theory:* Basic principle of MOT, LCAO, Bonding and anti-bonding molecular orbital, Energy level diagram for molecular orbital. Rules for adding electrons in MO's, Bond order, Molecular orbital diagram of homo nuclear diatomic molecules such as H_2, N_2, O_2, and Ne_2.

B. Sc. First Year (Semester-II)

Paper-III, Organic + Inorganic Chemistry [CH-103]

Marks: 50 **Periods: 45**

Unit-I

Substituted carboxylic acids and its derivatives. Introduction. **10**

1.1 Substituted carboxylic acids

Hydroxy acids:-

A) Hydroxyethanoic acid.

i) Methods of formations:

a) from chloroacetic acid

b) from glycine

c) from pyruvic acid

ii) physical properties.

iii) chemical reactions:

a) oxidation

b) reduction

c) action of heat

B) Malic acid:-

i) Methods of formations:

a) from maleic acid

b) from ά bromosuccinic acid

c) from tartaric acid

ii) chemical reactions:

d) oxidation

e) action of HI

f) action of heat

C) Citric acid:-

i) Methods of formations:

a) from glycerol

b) from oxalacetic acid

ii) chemical reactions:

a) Dehydration

b) action of heat

D) Unsaturated monocarboxylic acids:

Introduction and nomenclature.

Methods of formations of propenoic acid

a) from ά ,β unsaturated aldehydes

b) from β-hydroxy acids

c) from acetylene.

Chemical reactions:

a) addition of HBr

b) addition of H_2O

1.2 Substituted carboxylic acid derivatives:

Relative stability of acyl derivatives.

Acid chlorides:-

Introduction, nomenclature of ethanoyl chloride.

Methods of formations:

a) By the action of thionyl chloride on acetic acid.
b) By the action of phosphorus pentachloride on acetic acid.

General reactions:

ii) hydrolysis
iii) action with alcohol
iv) action with amines
v) action with sodium acetate.

Acid anhydride:-

Introduction, nomenclature.

Methods of formations:

a) by reaction of acid halide and carboxylic acid..
b) By the distilling a mixture of sodium acetate and acetyl chloride.

General reaction:-

i) hydrolysis
ii) action with alcohol
iii) action with amines
iv) Action with benzene.

Esters:-

Methods of formations:

a) from ethyl alcohol and acetic acid
b) From ethyl alcohol and acetyl chloride.

General reaction:-

i) hydrolysis
ii) Alkaline hydrolysis.
iii) action with amines
iv) Reduction.

Amides;-

Methods of formations:

a) by the action of ammonia on acid chloride.
b) by the action of ammonia on acetic anhydride.

General reaction:-

i) hydrolysis
ii) action of nitrous acid
iii) reduction
iv) action of Br_2 and NaOH.

Unit-II

Organometallic Compounds: **06**

2.1 *Organomagnesium compounds:*

A] Preparation of methyl magnesium bromide.

B] Reactions of methyl magnesium bromide [CH_3-Mg-Br] to gives;

i) Ethanol, 2-Propanol, 2-methyl-2-propanol, Acetaldehyde and acetone, Acetic acid, Methylamine, Acetonitrile, Ethyl acetate.

2.2 *Organolithium compounds:*

A] Preparation of methyl lithium from methyl iodide.

B] Reactions of methyl lithium to give; 1) Methane, 2) Ethanol, 3)1-Propanol, 4) 2-Propanol

Unit-III

3.1 Aromatic Compounds: **07**

1. Introduction, Industrial source of aromatic compounds.
2. Kekule, Resonance and Molecular orbital picture of benzene, representation of benzene ring.
3. Modern theory of aromaticity:
   Delocalisation of π electrons, co-planarity, Hukel's rule and its application to benzene, Naphthalene, Antracene, Pyrrol, Furan and Pyridine.
4. Electrophilic substitution to benzene (with mechanism):
   Nitration, Sulphonation, Halogenation (Bromination), Friedal-Craft Methylation and acetylation.
5. Activating and deactivating effect as observed in nitration of phenol and nitrobenzene.

3.2 Phenols: **07**

1. Introduction and classification of phenols.
2. Acidic character, Comparison of acidity of phenol and ethanol.
3. Reactions of phenol;
   a) Reimer-Tiemann reaction with mechanism.
   b) Acetylation
   c) Fries rearrangement with mechanism.
   d) Lederer-Manase reaction.
   e) Carboxylation (Kolbe's reaction)
   f) Claisen rearrengment.
   g) Hauben-Hoesch reaction.

Section-B

Unit-I

Metallurgy: **10P**

1.1 Occurrence of metals, General principles of metallurgy. Concentration of ore by hand picking, Gravity separation, Magnetic separation, Electrostatic separation, Froath Floatation, Leaching. Calcinations, Roasting. Reduction of metals by displacement, Thermal, Carbon, Aluminium (Goldschmitt process). Refining of metal by thermal

decomposition, Electro refining, Zone refining.

1.2 Metallurgy of Iron: Occurrence, Types of iron, Extraction of cast-iron from haematite ore. Physical and chemical properties, Uses.

1.3 Metallurgy of Aluminium: Occurrence , extraction, refining, properties and study of alloys.

Unit-II

Oxidation and reduction: **05P**

2.1 Definition of oxidation, Reduction, Oxidizing agent and reducing agents according to electronic concept.

2.2 Definition of oxidation, Reduction, Oxidizing agent and reducing agents according to oxidation number concept. Rules for assigning oxidation number,

2.3 Balancing of redox reaction by 1) Ion-electron method and 2) Oxidation number method.

2.4 Redox potentioal and its applications.

Reference Books:

1. Organic Chemistry: Morrison and Boyd.
2. Organic Chemistry: Vol I & II by I. L. Finar.
3. Organic Chemistry: Pine.
4. Advanced Organic Chemistry: M. K. Jain.
5. Organic Chemistry: Vol. I, II, & III by S. P. Singh, Mukharji and Kapoor.
6. Advanced Organic Chemistry: B. S. Bhal and Arun Bhal.
7. A Guide book to mechanism on Organic Chemistry: Peter Sykes.
8. Text Book of organic Chemistry: P. L. Soni.
9. Principles of Inorganic chemistry by Puri, Sharma and Kalia.
10. Advanced inorganic chemistry by Gurudeep Raj and Chatwal Anand.
11. Concise Inorganic Chemistry by J. D. Lee.
12. Basic Inorganic Chemistry by F. A. Cotton, G. Wilkinson and P. L. Gaus.
13. Inorganic Chemistry by A. G. Sharp.
14. Inorganic Chemistry by G. L. Miessler and D. A. Tarr.

B. Sc. First Year (Semester-II)
Paper-IV; CH-104
Physical + Inorganic Chemistry

Marks: 50 **Periods: 45**

Unit-I
Atomic structure: **10P**
1.1. Daltons atomic theory, Limitation of Daltons atomic theory.
1.2. Electron, its discovery and properties.
1.3. Proton- its discovery and properties.
1.4. Thomson's Atomic model and its drawbacks. Rutherford's alpha particles scattering experiments. Rutherford's atomic model and its drawbacks.
1.5. The Neutron – its discovery and properties.
1.6. Bohr's model of hydrogen atom, postulates, derivation for its radius and energy, atomic spectra. Application of Bohr's theory, spectra of hydrogen. Limitations of Bohr's theory.
1.7.Quantum numbers.
1.8. Pauli's Exclusion principle, Hund's rule of maximum multiplicity and Aufbau principle .
1.9.Numerical Problems.

Unit-II
Liquid State :- **06P**
2.1. Surface tension of liquid, units of surface tension, effect of temperature on surface tension, determination of surface tension of liquids by Stalagmometer method. Numerical Problems.
2.2. Viscosity of liquid, units of viscosity, effect of temperature on viscosity, measurement of viscosity of liquid by Ostwald's method. Numerical Problems.
2.3. Parachor and chemical constitution: Relation between parachor and surface tension, application of parachors in deciding structures. Numerical Problems.

Unit-III
Colloidal State: **07P**
3.1. Definition of colloids. Type of colloidal systems.
3.2. Solids in liquids (sols):-
3.2.1.Preparation of sols: Dispersion and Aggregation methods.
3.2.2. Properties of sols : Colour, optical, kinetic and electrical properties.
3.2.3. Stability of sols, protective action, Hardy-Schulze law, gold number.
3.3. Liquids in liquids (emulsions):- Types of emulsions, preparation, Emulsifier.
3.4. Liquids in solids (gels):- Classification, preparation and properties, inhibition,
3.5.General applications of colloids.

Unit-IV

Catalysis: **07P**

4.1. Catalyst ;- Type of catalyst, positive and negative catalyst with examples.
4.2. Catalysis:-Type of catalysis, homogenous and heterogeneous catalysis with examples.
4.3. Characteristics of catalytic reactions.
4.4. Promoters: - Definition, example, explanation of promotion action.
4.5. Catalytic poisoning: - Definition, example, explanation of catalytic poisoning.
4.6. Active centre on catalyst surface.
4.7. Acid – Base catalysis.
4.8. Enzyme catalysis, examples .Mechanism of enzyme catalysis. Characteristics of enzyme catalysis.
4.9. Application of catalysis in industries.

Section-B

Unit-I **06P**

Acids and bases:

1.1 Introduction (In introduction only discuss the definition of acids and bases according to Arrhenius, Bronsted and Lowery and Lewis)
1.2 Solvents system concept for acids and bases.
1.3 Lux-Flood concept for acids and bases and their limitations.
1.4 Hard and soft acids and bases:
Definition (Pearson's Concept), Bonding in hard-hard and soft-soft combination, HSAB principle, Applications of HSAB principle-Stability of complex, prediction of co-ordination in complex of ambidant ligands, prediction of feasibility of reaction and prediction of hardness and softness.

Unit-II

Principles involved in Volumetric Analysis: **09P**

2.1 Basic requirements of a titration reaction, Standard solution, Primary and secondary standards, Requirements of primary and secondary standards. Types of volumetric titrations: Acid-Base, Oxidation-reduction, Complexometric, Precipitation.
2.2 *Acid-Base Titration:* Theories of acid base titration, Theory of indicators: Ostwald's and Quinonoid theory, Principles involved in titration of a) Strong acid against strong base, b) Strong acid against weak base.
2.3 *Redox Titration:* Principles involved in titration of a) Fe^{++} against $KMnO_4$, b) Fe^{++} against $K_2Cr_2O_7$ (By internal and external indicators), Theories of redox Indicator.
2.4 *Precipitation titration:* Principles involved in titration of a) Ag^{+} against NaCl (Mohr's Method). Theory of adsoption indicator.
2.5 *Complexometric Titration:* Principles involved in titration of a) Ca^{++} against EDTA. Theories of metal ion indicators.

Reference Books:-

1. Mathematical preparation for physical Chemistry .By F. Daniel, Mc. Graw Hill publication.
2. University General Chemistry. By C.N. R. Rao Mc. Millan Publication.
3. Principles of Physical Chemistry. By Maron and Pruton 4th Ed. Oxford and IBH publication.
4. Physical Chemistry. By G.M. Barrow.
5. Essentials of Physical Chemistry .By B. S. Bahl, G. D. Tuli, Arun Bahl (S. Chand and Co Ltd.) (25th edition)
6. Elements of Physical Chemistry. By S. Glasstone and D. Lewis (The Macmillan Press Ltd.)
7. Physical Chemistry. By Robert A. Alberty (John Willey and Sons)
8. Principles of Physical Chemistry. By Puri– Sharma.
7. The Elements of Physical Chemistry .By P. W. Atkins
8. Advanced Physical Chemistry. By Harish Gurudeep.
9. Principles of Inorganic chemistry by Puri, Sharma and Kalia.
10. Advanced inorganic chemistry by Gurudeep Raj and Chatwal Anand.
11. Concise Inorganic Chemistry by J. D. Lee.
12. Basic Inorganic Chemistry by F. A. Cotton, G. Wilkinson and P. L. Gaus.
13. Inorganic Chemistry by A. G. Sharp.
14. Inorganic Chemistry by G. L. Miessler and D. A. Tarr.

B. Sc. First Year
Paper-V [CH-105]
Laboratory Course-I

Marks: 100 **Periods: 120**

A) Inorganic Chemistry:

Note: Any six experiments should be carried out.

1. Prepare standard Na_2CO_3 solution. Standardize the given HCl solution and estimate the amount of NaOH in the given solution.
2. Estimate the amount of NaOH and Na_2CO_3 in the given mixture using standard HCl solution.
3. Estimate the amount of NH_3 in the given sample of NH_4Cl by blank titration method (Indirect method).
4. Estimate the amount of Fe^{++} and Fe^{+++} separately in the given mixture using standard $K_2Cr_2O_7$ solution.
5. Standardize the given sodium thiosulfate solution using standard iodine solution and estimate the amount of $Na_2S_2O_3$ in the given solution.
6. Estimate the amount of Cu^{++} in the given solution using standard $Na_2S_2O_3$ solution.
7. Find out the strength of supplied $AgNO_3$ solution using standard $AgNO_3$ solution NH_4SCN as link solution (Volhard's method).
8. Find out the strength of supplied NaCl solution using standard NaCl and $AgNO_3$ as link solution (Mohr's method).
9. Standardize the given EDTA solution by using standard Zn^{++} solution and estimate the amount of Ca^{++} from given solution.
10. Estimate the amount of Al^{+++} in the given solution by back titration method using EDTA solution.

B] Organic Chemistry:

I. Preparation of organic compounds (Any Four):
   a) Phthalimide from phthlic anhydride and urea.
   b) Acetanilide from aniline.
   c) Iodoform from Acetone.
   d) Phenyl-azo-β-naphthol from aniline.
   e) M-dinitrobenzene from nitrobenzene.
   f) Phthalic anhydride from phthalic acid.

II. Determination of Physical constant of organic compounds (Any Five)
   a) Melting point of: 1. Naphthalene 2. Benzoic acid 3. Phthalic acid 4. Cinnamic acid 5. acetanilide 6. m-dinitrobenzaene.
   b) Boiling point of: 1. Aniline 2. Ethanol 3. Toluene 4. Benzene.

III. Demonstration of Purification of crystallization of: 1. Phthalic acid from hot water or by sublimation 2. Benzoic acid from hot water. 3. Naphthalene from ethanol.

C] Physical Chemistry (Any Six)

1. Determination the Viscosity of liquid by Oswald's viscometer.
2. Determination the viscosity of two pure liquids A & B, Hence find the composition of the mixture of two liquids. (Density data of liquids, viscosity of water to be given) [Any two liquids from: Acetone, CCl_4, Chloroform, Ethyl alcohol. Benzyl alcohol, Ehylene glycol and n-propyl alcohol.]
3. To determine the surface tension of a given liquid by stalagmometer method.
4. Determine the equivalent weight of magnesium by using Eudiometer
5. To study Kinetics of hydrolysis of ester in presence of minaral acid like HCl.
6. Preparation of As_2S_3 solution from As_2O_3 and compare the precipitation power of NaCl and $MgCl_2$.
7. To study distribution of benzoic acid between benzene and water.
8. To study critical solution temperature (CST) of phenol water system.
9. Determination of Heat of solution of KNO_3/ NH_4Cl.
10. Determination of Heat of reaction of displacement of copper by zinc.

Reference Books:

1. Advanced Practical Inorganic Chemistry by Gurudeep Raj.
2. A textbook of quantitative inorganic analysis by A. I. Vogel.
3. Experiments in Inorganic Chemistry by Gurtu and Kapoor.
4. Practical Organic Chemistry by A. I. Vogel.
5. Experiments in general chemistry by C.N.R. Rao and Agrawal East West Press.
6. Experiments in Physical Chemistry by R.C. Das and Behere Tata Mc Graw Hill.
7. Experimental physical Chemistry by F. Daniel and others (International Student Edition).
8. Systematic Experimental Physical Chemistry by S.W. Rajbhoj and Dr. T. K. Chodhekar, Anjali Publication Aurangabad.
9. Advanced Practical Physical Chemistry by J. B. Yadav (Goel Publishing house, Meerut).
10. Experiments in Chemistry by D. V. Jahagirdar.

FACULTY OF SCIENCE
B. Sc. (First Year) EXAMINATION
Chemistry
Paper-V, Laboratory Course-I, (CH-105)

Time: 6 Hrs. **Maximum Marks: 100**

N. B.:

(i) *Use of logarithmic table and Non-programmable calculator is allowed.*

(ii) *No candidate is allowed to appear for practical examination without certified record book.*

(iii) *Obtain the signature of examiner on your observations and readings.*

Q. 1 a) Viva-voce 05

b) Certified Laboratory Journal 05

Section-A (Inorganic Chemistry)

Q. 2 Prepare …….N solution of Na_2CO_3. Standardize the given HCl solution and estimate the amount of NaOH in the given solution. 30

OR

Estimate the amount of……. and ……in the given mixture using standard ……..N solution.

OR

Estimate the amount of NH_3 in the given sample of NH_4Cl by blank titration method ((Indirect Method)

OR

Standerdize the given …….. solution using standard ……..N…….solution and estimate the amount of ……in the given solution.

OR

Find out the strength of supplied …….solution using standard ……..N …….solution and ……. As link solution.

OR

Estimate the amount of Cu^{++} in the given solution using standard…….N Na_2CO_3 solution.

OR

Estimate the amount of Al^{+++} in the given solution by blank titration using standard ……..N EDTA solution.

Section-B (Organic Chemistry)

Q. 3 a) Prepare the pure crystalline sample of …… from …….. and determine its melting point. 20

b) Determine the melting point / boiling point of the given organic compounds. 10

Section-C (Physical Chemistry)

Q. 4 Determine the Viscosity of given liquid by Ostwald's Viscometer. 30

OR

Determine the surface tension of the given liquid by Stalagmometer method

OR

Determine the equivalent weight of Magnesium by hydrogen displacement method using Eudiometrically.

OR

Study of kinetics of hydrolysis of ester in the presence of HCl.

OR

Prepare As_2S_3 solution and compare the precipitating power of NaCl and $MgCl_2$.

OR

Determine the distribution coefficient of benzoic acid between benzene and water.

OR

Determine the critical solution temperature (CST) of phenol-water system.

OR

Determine the Viscosity of two pure liquids……..and …….. find out the composition of the mixture of two liquids.

OR

Determine the heat of solution of KNO_3/ NH4Cl.

OR

Determine the heat of displacement of copper from $CuSO_4$ by zinc dust.