

# Swami Ramanand Teerth Marathwada University, Nanded



**B. O. S. IN CHEMISTRY**

**B. SC. SECOND YEAR (CHEMISTRY)  
SEMESTER-III & IV**

**IN FORCE FROM JUNE - 2010**

---

**B. Sc. SECOND YEAR (SEMESTER-III)  
CHEMISTRY**

---

<b>Paper</b>	<b>Course No.</b>	<b>Course</b>	<b>Periods / week</b>	<b>Total Periods</b>	<b>Marks</b>
VIII	CH-201	Inorganic Chemistry	2	30	32
IX	CH-202	Organic Chemistry	2	30	34
X	CH-203	Physical Chemistry	2	30	34

---

**B. Sc. SECOND YEAR (SEMESTER-IV)  
CHEMISTRY**

---

<b>Paper</b>	<b>Course No.</b>	<b>Course</b>	<b>Periods / week</b>	<b>Total Periods</b>	<b>Marks</b>
XI	CH-204	Inorganic Chemistry	2	30	32
XII	CH-205	Organic Chemistry	2	30	34
XIII	CH-206	Physical Chemistry	2	30	34
XIV	CH-207	Laboratory Course-II	4	120	50
XV	CH-208	Laboratory Course-III	4	120	50

**B. Sc. Second Year (Semester-III)**  
**Paper-VIII, [CH-201]**  
**Inorganic Chemistry**

**Marks: 32**

**Periods: 30**

**Unit:-I**

**1.1 Theory of Qualitative Analysis**

**08**

- 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<sub>A</sub> and II<sub>B</sub>,      ii) Separation of II and III<sub>B</sub>.
  - iii) Separation of III<sub>A</sub> and III<sub>B</sub>,    iv) Separation of Zn<sup>++</sup> and Mn<sup>++</sup>.
  - v) Separation of Co<sup>++</sup> and Ni<sup>++</sup>    vi) Separation of Fe<sup>+++</sup> and Al<sup>+++</sup>.
  - vii) Separation of Cu<sup>++</sup> and Cd<sup>++</sup>.
- e) Use of organic reagents in qualitative analysis.
  - i) 8-Hydroxy quinoline for aluminium; ii)  $\alpha$ -Benzoinoxime for copper.
  - iii) Dimethylglyoxime for Nickel; iv) 1,10-Phenanthroline for Iron.
  - v)  $\alpha$ -Nitroso- $\beta$ -naphthol for cobalt.

**1.2 Chemistry of Non-transition elements-Part-I**

**06**

- a) Complexes of alkali metals, the 'wrap around' complexes.
- b) **Boranes:** Definition, classification and nomenclature. Preparation, properties, structure and bonding of diborane with evidences.
- c) **Carboranes:** Definition of Closo and Nido carboranes. Preparation, properties and structure of dicarboclosododecaboranes.
- d) **Borazine:** Preparation, properties, structure and bonding. Similarities between borazine and benzene.

**Unit:-II**

**2.1 Chemistry of Non-transition elements-Part-II**

**06**

- 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<sub>2</sub>), Metallic carbide (TiC) and covalent carbides (SiC).
- d) Fullerene: Preparation, properties, structure and applications.

**2.2 Chemistry of Halogen compounds**

**10**

- a) Inter-halogen compounds:
  - i) Definition, preparation and structure of XY, XY<sub>3</sub>, XY<sub>5</sub>, and XY<sub>7</sub> 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<sub>2</sub><sup>-</sup>, & ICl<sub>4</sub><sup>-</sup>
- d) Oxides of halogens: Preparation, structure & uses of F<sub>2</sub>O, Cl<sub>2</sub>O, Cl<sub>2</sub>O<sub>7</sub>, & I<sub>2</sub>O<sub>5</sub>. Oxyacids of halogens: Introduction, oxidation state, structure strength and stability. Basic properties of halogens: I<sup>+</sup> and I<sup>+3</sup> compounds and their preparation.

**B. Sc. Second Year (Semester-III)**  
**Paper-IX, [CH-202]**  
**Organic Chemistry**

**Marks: 34**

**Periods: 30**

**Unit:-I**

**1.1 Aromatic Carbonyl Compounds: 12P**

- A) Introduction and structure of carbonyl group.  
B) Synthesis of benzaldehyde:  
1) Gattermann synthesis; 2) Gattermann Koch synthesis.  
C) Synthesis of acetophenone: 1) From benzene, 2) From 1-phenylethanol  
D) Physical properties of benzaldehyde and acetophenone.  
E) Reactions:  
i) Addition of (a) hydrogen cyanide, (b) sodium bisulphate to benzaldehyde and acetophenones.  
ii) Condensation with (a) ammonia, (b) methanamine, (c) hydroxylamine, (d) hydrazine, (e) phenyl hydrazine, (f) acetyl hydrazine (semicarbazide) to benzaldehyde and acetophenones.  
F) Name reactions (with mechanism):  
1) Aldol Condensation (simple and crossed), 2) Perkin Condensation, 3) Benzoin condensation, 4) Cannizzaro reaction, 5) Mannich reaction  
G) Oxidation of acetophenones using:  
1. Chromic acid, 2. Per-acids (Baeyer-Villiger reaction)  
H) Reduction of acetophenones by  
1)  $\text{LiAlH}_4$  and  $\text{NaBH}_4$ , 2) Aluminium isopropoxide (M.P.V)

**1.2 Polymers: 06P**

- A) Introduction, and classification.  
B) Types of polymerization reactions:  
i) Addition (chain growth) polymerization, Free-radical polymerization reaction, Cationic polymerization reaction, Anionic polymerization reaction.  
ii) Condensation (step growth) polymerization reaction.  
Bakelite formation (phenol formaldehyde resin)  
C) Synthesis and uses of: i) Teflon, ii) Polystyrene, iii) Polyvinylchloride, iv) Buna rubber (Buna-N & S)

**Unit:-II**

**2.1 Stereochemistry: 08P**

- A) Introduction, B) Concept and types of isomerism: i) Structural and stereoisomerism, ii) Types of Structural isomerism (Chain, position, functional, metamerism, tautomerism); iii) Types of stereoisomerism (Conformational and configurational)  
C) Optical isomerism (Enantiomerism):  
i) Concept of asymmetric carbon atom, chiral centre, ii) Dextro and Laevo forms, Racemic mixture, iii) Element of symmetry (plane, centre and axis of symmetry), iv) Concept of diastereoisomers, v) Racemic modification, vi) Resolution (concept and methods), vii) Walden inversion.  
D) Geometrical Isomerism: Cis-trans and *E* and *Z* system of nomenclature.  
E) Optical isomerism: i) Relative configuration, ii) Absolute configuration.

**2.2 Organic Synthesis via Enolates: 04P**

- Synthesis of ethyl acetoacetate by Claisen condensation reaction (with mechanism), Ketol-Enol tautomerism of ethyl acetoacetate, Synthetic applications of ethyl acetoacetate. Synthesis of enamines. Acetylation and alkylation reaction of enamines.

**B. Sc. second Year (Semester-III)**  
**Paper-X, [CH-203]**  
**Physical Chemistry**

**Marks: 34**

**Periods: 30**

**Unit I:**

**1.1 Atomic Structure and Wave Mechanics: 10P**

- a) Planck's quantum theory of radiation.
- b) Photoelectric effect, explanation on the basis of quantum theory.
- c) Compton Effect.
- d) de-Broglie hypothesis: derivation of de-Broglie equation, explanation.
- e) Davisson-Germer experiment.
- f) Heisenberg's uncertainty principle: Statement, explanation.
- g) Schrodinger wave equation: Derivation in time independent form and Laplacian operator form. Physical significance of wave function ( $\Psi$ ) and  $\Psi^2$ . Application of Schrodinger wave equation to particle in one dimensional box.
- h) Numericals on photoelectric effect, de-Broglie equation, Heisenberg's uncertainty principle and particle in one dimensional box.

**Unit II:**

**2.1 Thermodynamics: 11P**

- a) Introduction to First law of thermodynamics.
- b) Joule's law. Joule-Thomson effect. Joule-Thomson coefficient and inversion temperature.
- c) Need for second law thermodynamics, different statements of second law of thermodynamics. Carnot's cycle and its efficiency. Carnot's theorem.
- d) Concept of entropy: Introduction, Definition, Mathematical Expression, Unit. Entropy as a state function. Entropy changes for reversible and irreversible processes in isolated systems. Entropy change in Physical transformations: (i) Fusion of a solid. (ii) Vaporization of a liquid. (iii) Transition from one crystalline form to another. Entropy changes for an ideal gas as a function of V and T and as a function of P and T. Entropy changes of an ideal gas in different processes. Physical significance of entropy.
- e) Numericals on efficiency of Carnot cycle, entropy change in physical transformations and entropy changes of an ideal gas in different processes.

**Unit-III**

**3.1 Phase equilibrium 09P**

- a) Phase rule, Statement and explanation of the terms-phase, component and degree of freedom.
- b) Phase equilibria of one component system: Water system, Sulphur system and CO<sub>2</sub> system.
- d) Phase equilibria of two component system: Pb-Ag system, desilverisation of lead, KI-H<sub>2</sub>O system.
- e) 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.

**B. Sc. Second Year (Semester-IV)**  
**Paper-XI, [CH-204]**  
**Inorganic Chemistry**

**Marks: 32**

**Periods: 30**

**Unit-I**

**1.1 Chemistry of Transition series elements: 08**

- a) Introduction and position in periodic table.
- b) Electronic configuration of first, second and third transition elements.
- c) General properties of transition series elements.
- d) Study of first transition series elements with reference to atomic size, oxidation state, colour, catalytic behavior, and tendency to form complex compounds.
- e) Magnetic properties: Para-magnetism, Di-magnetism, Ferro-magnetism, anti-Ferro-magnetism, magnetic susceptibility, and magnetic moment of ions (Numericals). Comparison between Para-magnetism and diamagnetism.

**1.2 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  $\alpha$ ,  $\beta$ , and  $\gamma$  particles, group displacement law.
- f) Application of radioisotopes in medicine, agriculture, industry, and carbon dating.

**Unit-II**

**2.1 Noble Gas Chemistry: 06**

- a) Position in the periodic table.
- b) Electronic configuration.
- c) Compounds of inert gases. under excited condition, through coordination, by physical trapping (Clathrates).
- d) Fluorides of xenon:  $\text{XeF}_2$ ,  $\text{XeF}_4$ , and  $\text{XeF}_6$  preparation, properties and structure.

**2.2 Inorganic Polymers: 06**

- a) Preparation properties, structure and applications of Silicones,  $\text{S}_4\text{N}_4$ , Polythiazyl and phosphazine (Trimer)

**Reference books:-**

1. Principles of Inorganic Chemistry by Puri, Sharma and Kaliya.
2. Inorganic Chemistry by Gurudeep Raj Chatwal.
3. Advanced inorganic chemistry vol. II by Satyaprakash, Tuli, Basu and Madan.
4. Inorganic Chemistry by Huheey, Keiter and Keiter.
5. Nuclear Chemistry by Arnikar, 6. Concise Inorganic Chemistry by J. D. Lee.
6. Vogel's Qualitative Inorganic Analysis (Seventh Edition),
7. A text book of Practical Chemistry for B. Sc. By V. V. Nadkarny, A. N. Kothare and Y. V. Lawande.
8. Advanced practical inorganic Chemistry by O. P. Agarwal.

**B. Sc. Second Year (Semester-IV)**  
**Paper-XII, [CH-205]**  
**Organic Chemistry**

**Marks: 34**

**Periods: 30**

**UNIT-I**

**1.1 Carbohydrates: 10P**

- A) Introduction, B) Classification and nomenclature.  
C) Reactions of Monosaccharides:  
i) Mutarotation with mechanism, ii) Epimerization, iii) Ether formation, iv) Osazone formation of glucose (with mechanism), v) Reduction of glucose, vi) Oxidation of glucose.  
D) Interconvert ions:  
i) Glucose to Fructose, ii) Fructose to Glucose, iii) Glucose to Mannose, iv) Glucose to Arabinose (Ruff degradation), v) Arabinose to Glucose (Kiliani synthesis)  
E) Pyranose structure of glucose:  
F) Fermentation of sucrose (general procedure and reaction).

**1.2 Organic compounds of nitrogen: 07P**

- A) Urea:  
i) Synthesis of urea by Wohler's method and  $\text{CO}_2$   
ii) Reactions: a) Action of heat, b) nitrous acid, c) hydrolysis, d) thionyl chloride, e) formaldehyde, f) hydrazine, g) acetyl chloride, h) salt formation.  
B) Aromatic amino compounds:  
i) Introduction, classification.  
ii) Preparation of aniline from: a) nitrobenzene b) chlorobenzene  
iii) Reactions: Carbylamine reaction, Salt formation, acetylation, Reaction with benzaldehyde, Acetophenone.  
C) Diazonium salts:  
i) Introduction, preparation of Benzene Diazonium chloride.  
ii) Structure of Diazonium salts.  
iii) Reactions involving removal of diazo group ( $\text{N}_2\text{X}$ ) by a) Hydrogen, b) Halogen, c) Cyano group, d) Hydroxyl group, e) Alkoxy group.  
iv) Reactions involving retention of diazo group: Coupling with aniline and phenol.

**UNIT-II**

**2.1 Heterocyclic Compounds: 10P**

- i) Introduction, Nomenclature and classification.  
ii) Molecular orbital picture and resonance structure of oxole, azole, thiole, and azine.  
iii) Study of heterocyclic compounds:  
A) Oxole (furan):  
i) Synthesis from: Fiest Benary method and Mucic acid.  
ii) Properties: physical and chemical: sulphonation, nitration (with mechanism), reduction and reactions with n-butyl lithium & benzyne.  
B) Azole (Pyrrole):  
i) Synthesis from Succinamide and Oxole (furan).  
ii) Properties: physical and chemical: nitration (with mechanism), reduction and ring expansion.  
C) Thiole (Thiophene):  
i) Synthesis from n-butane and acetylene.

ii) Properties: physical and chemical: nitration (with mechanism), reduction, chlorination, and chloromethylation.

**D) Azine (Pyridine):**

i) Synthesis from acetylene and penta-methylenediamine hydrochloride.

ii) Properties: physical and chemical: amination (with mechanism), reduction, oxidation, bromination reactions.

**2.2 Polynuclear Hydrocarbon:**

**03P**

Introduction and classification.

**A] Naphthalene:**

1. Synthesis of naphthalene from 4-phenylbut-1-ene, & 4-phenylbut-3-enoic acid.

2. Physical properties and reactions of naphthalene: Friedel-Craft acylation, nitration and halogenation.

**B] Anthracene:**

1. Synthesis of anthracene from naphthaquinone & o-bromobenzyl bromide.

2. Physical properties and reactions of anthracene: halogenation, nitration, sulphonation, Friedel-Craft acylation and alkylation.

**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 chemistry by 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. Stereochemistry by P. S. Kalsi.
9. Organic chemistry by I. L. Finar.



**B. Sc. Second Year (Semester-IV)**  
**Paper-XIII, [CH-206]**  
**Physical Chemistry**

**Marks: 34**

**Periods: 30**

**Unit I:**

**1.1 Chemical Kinetics:**

**10P**

- a) Introduction: Rate of reaction, Definition and units of rate constant, Factors affecting rate of reaction, Order and Molecularity of reaction.
- b) Zero order reaction: Rate expression and Characteristics.
- c) First order reaction: Rate expression and Characteristics.
- d) Pseudounimolecular reactions.
- e) Second order reaction: Derivation of rate constant for equal and unequal concentrations of the reactants. Characteristics of second order reaction.
- f) Methods of determination of order of a reaction.
- g) Collision theory of reaction rates.
- h) Effect of temperature on reaction rates and Arrhenius equation.
- i) Numericals on first order reactions, second order reactions, half-life method and Arrhenius equation.

**Unit II:**

**2.1 Electrochemistry:**

**12P**

- a) Introduction, Conduction of electricity, Types of conductors: electronic and electrolytic.
- b) Conductance of electrolytes: Conductance, Specific resistance, Specific conductance, Equivalent conductance, Molecular conductance and their units.
- c) Variation of specific and equivalent conductance with dilution, Equivalent conductance at infinite dilution. Effect of temperature on conductance.
- d) Measurement of conductance by Wheatstone bridge, conductivity cell, Cell constant and its determination.
- e) 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.
- f) Migration of ions, Transport number.
- g) Kohlrausch law, Applications of Kohlrausch 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. (v) Determination of absolute ionic mobility. (vi) Determination of ionic product of water.
- h) 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.
- i) Advantages of conductometric titrations.
- j) Numericals on Specific conductance, Equivalent conductance, cell constant and Kohlrausch law to calculate  $\lambda_{\infty}$ .

**Unit III:**

**3.1 Photochemistry:**

**08P**

- a) Introduction to photochemistry, types of chemical reactions, difference between thermal and photochemical reactions.
- b) Lambert-Beer Law: Light absorption by solution, molar extinction coefficient, transmittance, absorbance, optical density.

- c) Laws of photochemistry: Grothus-Drapper law, Stark-Einstein law of photochemical equivalence.
- d) Quantum yield, experimental determination of quantum yield. High and low quantum yield reactions. Reasons for high and low quantum yield.
- e) Jablonski diagram with various Processes occurring in the excited state. Qualitative description of Fluorescence, phosphorescence, non-radiative processes (internal Conversion, inter- system crossing).Photosensitized reactions.
- h) Numericals on quantum yield.

**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 Jalandher,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).
13. Text Book of Physical Chemistry by Soni-Dharmarha.
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 ).

**B. Sc. Second Year (Semester-IV)**  
**Paper-XIV, [CH-207]**  
**Laboratory Course-II**

**Marks: 50**

**Periods: 120**

**Note: At least sixteen experiments should be taken.**

**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.

- a) Acids: Benzoic acid, phthalic acid, salicylic acid, cinnamic acid.
- b) Base: P-nitroaniline, aniline, P-toluidine.
- c) Phenols: phenol,  $\alpha$ -naphthol,  $\beta$ -naphthol.
- d) Neutral : Naphthalene, Anthracene, acetanilide, Nitrobenzene, M-dinitrobenzene.

**3. Quantitative analysis (estimation)**

- i) Estimation of glycine by Sorenson's method
- ii) Estimation of formaldehyde.
- iii) Estimation of glucose
- iv) Estimation of phenol.
- v) Estimation of amide.
- vi) Estimation of cinnamic acid (Unsaturation).

**Inorganic Chemistry:**

1. Identification of two acidic and two basic radicals by semi-micro qualitative technique.  
(At least eight mixtures of salt must be practiced including interfering radicals).

**B. Sc. Second Year**  
**Paper-XV, [CH-208]**  
**Laboratory Course-III**  
**Physical and Inorganic Chemistry**

**Marks: 50**

**Periods: 120**

**Note: At least sixteen experiments should be taken.**

**Instrumental**

1. Determine the normality and strength of strong acid (HCl / H<sub>2</sub>SO<sub>4</sub>/ HNO<sub>3</sub>) conductometrically using standard solution of strong base (NaOH / KOH).
2. Determine the normality and strength of weak acid (CH<sub>3</sub>COOH / HCOOH) conductometrically using standard solution of strong base (NaOH / KOH).
3. To determine the solubility of sparingly soluble salts (BaSO<sub>4</sub> / PbSO<sub>4</sub> / AgCl) conductometrically at room temperature.
4. Determine the normality and strength of strong acid (HCl / H<sub>2</sub>SO<sub>4</sub>/ HNO<sub>3</sub>) potentiometrically using standard solution of strong base (NaOH / KOH).
5. Determine redox potential of Fe<sup>+++</sup>/ Fe<sup>++</sup> or Sn<sup>4+</sup>/ Sn<sup>3+</sup> or Ce<sup>4+</sup> / Ce<sup>3+</sup> system by titrating it with standard K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> / KMnO<sub>4</sub> potentiometrically.
6. Verification of Lambert's law using KMnO<sub>4</sub>/ NiSO<sub>4</sub>/ K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> / CuSO<sub>4</sub> colorimetrically and determine concentration of unknown solution.
7. Determine the concentration of Cu<sup>++</sup> in given solution titrating it against std. EDTA solution by colorimetric measurement.
8. To determine the hydrolysis constant of anilinehydrochloride 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<sub>2</sub>S<sub>2</sub>O<sub>8</sub>.
3. Determine the parachor of p-dichloro benzene by stalgmometer method.
4. Determine the radius of a molecule (Glycerol / sucrose) by viscosity measurements.
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.

**Inorganic Chemistry**

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

1. Cu<sup>++</sup> + Zn<sup>++</sup>
2. Ba<sup>++</sup> + Ca<sup>++</sup>
3. Mn<sup>++</sup> + Zn<sup>++</sup>
4. Fe<sup>++</sup> + Al<sup>+++</sup>

**Reference Books:**

1. Experimental Physical Chemistry by A. Findlay. Longman.
2. Advanced Practical Physical Chemistry by J.B. Yadav. (Goel Publishing house, Meerut).
3. Experiments in Physical Chemistry by R. C. Das and B. Behra. Tata Mc Graw Hill.
4. Advanced experimental Chemistry Vol. I. Physical by J. N. Gurtu and R. Kapoor. S. Chand & Co.
5. Experiments in Physical Chemistry by J. C. Ghosh, Bharati Bhavan.
6. Practical book of Physical Chemistry – by Nadkarni Kothari & Lawande. Bombay Popular Prakashan.
7. Systematic Experimental Physical Chemistry – by S. W. Rajbhoj, Chondhekar. Anjali Publication.
8. Practical Physical Chemistry – by B. D. Khosala & V. C. Garg. R. Chand & Sons.
9. Experiments in Chemistry by D. V. Jagirdar.
10. Practical Chemistry, Physical – Inorganic – Organic and Viva – voce by Balwant Rai Satija. Allied Publishers Pvt. Ltd.
11. College Practical Chemistry by H. N. Patel, S. R. Jakali, H. P. Subhedar, Miss. S. P. Turakhia. Himalaya Publishing House, Mumbai.
12. College Practical Chemistry by Patel, Jakali, Mohandas, Israney, Turakhia. Himalaya Publishing Housing, Mumbai.

**FACULTY OF SCIENCE**  
**PRACTICAL EXAMINATION**  
**B. Sc. (Second Year)**  
**Paper-VIII,**  
**CHEMISTRY**

**Time: 6 Hrs**

**Marks: 50**

*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	03
	b) Certified Laboratory Journal	02
Q. 2	Estimate the amount of..... By .....method.	12
	Procedure	03
Q. 3	Analyze the given organic compound qualitatively and find out the nature, detection of elements, functional group, physical constant and derivative.	15
Q. 4	Identification of two acidic and two basic radicals from given mixture by semi micro qualitative analysis. (Spot Test should be report to the examiners)	15

**FACULTY OF SCIENCE**  
**PRACTICAL EXAMINATION**  
 B. Sc. (Second Year) Paper-XV (CH-208)

**Time: 6 Hrs.**

**CHEMISTRY**

**Marks: 50**

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 03

b) Certified Laboratory Journal 02

Q. 2 To determine the normality and strength of strong acid (HCl /H<sub>2</sub>SO<sub>4</sub>/HNO<sub>3</sub>)  
 conductometrically using standard solution of strong base (NaOH/KOH). 15

OR

To determine the normality and strength of weak acid (CH<sub>3</sub>COOH/HCOOH)  
 conductometrically using standard solution of strong base (NaOH/KOH).

OR

To determine the solubility of a sparingly soluble salts (BaSO<sub>4</sub>/PbSO<sub>4</sub>/AgCl)  
 conductometrically at room temperature.

OR

To determine the normality and strength of strong acid (HCl /H<sub>2</sub>SO<sub>4</sub>/HNO<sub>3</sub>)  
 potentiometrically using standard solution of strong base (NaOH/KOH).

OR

To determine redox potential of Fe<sup>+++</sup> / Fe<sup>++</sup> or Sn<sup>4+</sup> / Sn<sup>3+</sup> or Ce<sup>4+</sup> / Ce<sup>3+</sup> system by  
 titrating it with standard K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> / KMnO<sub>4</sub> potentiometrically.

OR

Verification of Lambert's law using KMnO<sub>4</sub>/NiSO<sub>4</sub> / K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> / CoSO<sub>4</sub>  
 colorimetrically and determine concentration of unknown solution.

OR

To determine amount of Cu<sup>++</sup>/ Ni<sup>++</sup> ion in given sample solution titrating it against  
 std. EDTA solution colorimetrically

OR

Q. 3 To determine the hydrolysis constant of anilinehydrochloride by pH measurement.  
 To study the effect of addition of electrolyte (KCl / NaCl) on solubility of weak  
 acid at room temperature. 15

OR

To determine energy of activation of reaction between KI-K<sub>2</sub>S<sub>2</sub>O<sub>8</sub>.

OR

To determine the parachor of p-dichloro benzene by stalgmometer method.

OR

To determine the radius of a molecule (Glycerol / sucrose) by viscosity measurements.

OR

To determine partition coefficient of iodine between carbon tetrachloride and water.

OR

To determine the solubility of benzoic acid in water at different temperatures and  
 hence its heat of solution.

OR

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.

OR

Q. 4 To determine the enthalpy of neutralization of weak acid/weak base against strong  
 base/strong acid and determination of enthalpy ionization of weak acid/weak base

Separation of metal ions.....from mixture solution. Estimate the amount of  
 .....metal ion volumetrically.

a) Procedure 03

b) Separation 02

c) Estimation 10

