Solapur University, Solapur
B.Sc. Part-II
Chemistry
Credit and Grading System
In force from June-2015

General Structure :

There will be two theory papers of 70 marks for each semester. There titles & marks distribution are as under.

N. B.

i. Figures shown in bracket indicates the total number of contact hours required for the respective topics
ii. The question paper should cover the entire syllabus. Marks allotted questions should be in proportion to the number of contact hours allotted to respective topics.
iii. All topics should be dealt with S.I units.
iv. Use of scientific calculator is allowed.
v. Industrial tour is prescribed.

Semester-III

Paper-III : Organic Chemistry (70 marks)

Paper-IV : Inorganic Chemistry (70 marks)

Semester-IV

Paper-V : Physical Chemistry (70 marks)

Paper-VI : Analytical & Industrial Inorganic Chemistry (70 marks)

Practical Course : Practical Examination will be held at the end of the year - 200 marks

A) Distribution of marks :

a) Physical : 45 marks (35 marks physical experiment + 5 marks oral + 5 marks Journal)
b) Inorganic : 50 marks
I (25 marks gravimetric analysis + 15 marks preparation + 5 marks oral + 5 marks Journal)
II(25 marks for semimicro qualitative analysis+15 marks volumetric estimation + 5 marks oral+ 5 marks Journal).
c) Organic : 45 marks (20 marks for organic qualitative Analysis + 15 marks estimation/preparation+5 marks oral + 5 marks Journal)

B) Duration of Examination – Two days, 6 hrs. per day

Semester-III
Paper-III :Organic Chemistry

Total Credits : 3
(45 Contact hrs.)

1. Spectroscopic Methods (8)
Ultra-Violet (UV) absorption :

Introduction to Spectroscopy, Beer – Lambert law (mathematical derivation not expected), Types of electronic transitions, Terms used in UV spectroscopy: Chromophore, Auxochrome, Bathocromic Hypsochromic, Hypochromic and Hyperchromic shifts, Effect of conjugation on position of UV and visible bands. Calculation of max by Woodward-Fieser rules for conjugated dienes and enones. Applications of UV spectroscopy – Determination of structure and stereochemistry (cis and trans) spectral problems based on UV.

2. Stereochemistry (8)

2.1. Geometrical isomerism : Introduction, Geometrical isomerism in aldoximes and ketoximes, configuration of ketoximes-Beckmann transformation (Mechanism & Proof are not expected) configuration of aldoximes.

2.2. Conformational Isomerism : Introduction, conformation of ethane and n-butane and their representation by using Saw-Horse, Fischer (dotted Wedge line) and Newmann's projection formulae.

2.3. Conformational analysis of ethane and n-butane with the help of energy profile diagrams.

2.4. Nomenclature – D & L, R & S, E & Z systems

3. Alcohols and Phenols (8)

3.1. Alcohols : Introduction

i. Dihydric alcohols : Nomenclature, Methods of formation of ethylene glycol from ethylene, ethylene dibromide and ethylene oxide, physical properties & chemical reactions of ethylene glycol – acidic nature, reaction with hydrogen halide, oxidation – lead acetate, HIO_4 and nitric acid, Uses of ethylene glycol. Pinacol formation, Pinacol-Pinacolone rearrangement and its mechanism.

ii. Trihydric alcohols : Nomenclature, Methods of formation of glycerol – from fats and oils physical properties. Chemical reactions of glycerol – reaction with electropositive metals, reaction with hydrogen halide HCl and HI Reaction with conc. nitric acid in presence of conc. sulphuric acid. Reactions with potassium hydrogen sulphate, esterification, oxidation. Uses of glycerol.

3.2. Phenols : Introduction, Reactions of phenol (carbolic acid) :

i. Acylation and Fries rearrangement
ii. Ether formation and claisen rearrangement
iii. Gattermann Synthesis
iv. Carboxylation – Kolbe's reaction
v. Reimer – Tiemann reaction and its mechanism.

4. Aldehydes and Ketones (5)

Introduction, Nomenclature, structure and reactivity of the carboxyl group. Mechanism of nucleophilic additions to carbonyl group. Study of following reactions with mechanism 1) Aldol condensation (base catalysed), 2) Perkin reaction, 3) Cannizzaro's reaction, 4) Knoevenagel reaction 5) benzoin condensation..

5. Ethers and Epoxides (5)

5.1. Ethers : Introduction, Nomenclature, Methods of formation of anisole by Williamson's synthesis and from diazomethane, chemical reactions of anisole with HI, Gravimetric estimation of $–OCH_3$ group by Ziesel's method (Related problems are expected based on % of $–OCH_3$ and number of $–OCH_3$ groups).

5.2. Epoxides : Introduction, Nomenclature, commercial method of preparation of ethylene oxide. Acid and base catalysed ring opening of ethylene oxide, reactions of Grignard and organolithium reagents with ethylene oxide.

6. Carboxylic acids (7)

6.1. Monocarboxylic acids : Introduction. Methods of formation of Halo acids, di- and trichloroacetic acid by HVZ reaction, substitution reactions of monochloroacetic acid by nucleophiles CN^-, OH^-, I^-, and NH_3.

6.2. Hydroxy acids : Malic acid and citric acid, Methods of formation of malic acid from acid and moist Ag_2O. Reactions of malic acid – action of heat, oxidation reaction and reaction with HI, uses of malic acid. Methods of formation of citric acid from glycerol. Reactions of citric acid.
Acetylation with acetic anhydride reduction by HI, Action of heat at 422^0K. Uses of citric acid.

6.3. Unsaturated acids : Methods of formation of acrylic acid from acrolein and by dehydration of -hydroxyl propionic acid. Reactions of acrylic acid – Addition of H_2O reduction by Na / C_2H_5OH. Uses of acrylic acid. Methods of formation of cinnamic acid from benzaldehyde using diethyl malonate and by using acetic anhydride and sodium acetate. Reactions of cinnamic acid –
bromination, oxidation. Uses of cinnamic acid.

6.4. Dicarboxylic acids : Succinic and phthalic acids. Methods of formation of succinic acid from ethylene bromide, maleic acid. Reactions of succinic acid – action of heat, action of $NaHCO_3$, C_2H_5OH in presence of acid. Uses of succinic acid. Methods of formation of phthalic acid from o-xylene and naphthalene Reactions of phthalic acid – action of heat, reaction with sodalime, NH_3. Uses of phthalic acid.

7. Diazonium Salts (4)

7.1 Diazonium salts : Introduction, benzene diazonium chloride – preaparation, chemical properties.

i. Formation of iodo benzene
ii. Sandmeyer's reaction
iii. Formation of benzene
iv. Formation of phenylhydrazine
v. Azo coupling – synthesis of methyl orange and congo red.

Reference Books :

Latest editions of following reference books.

1. Organic Chemistry. Volume 1 – The fundamental principles by I.L. Finar.
2. Organic Chemistry. Volume 2 – Stereochemistry and the chemistry of natural. Products by I.L. Finar, Low-priced Edn. ELBS – Longman
3. Organic Chemistry. Volume I, II, III by S.M. Mukharjee, S.P. Singh and R.P. Kapoor. Wiley Eastern Limited.
4. Advanced Organic Chemistry by, B.S. Bahl, Arun Bahl. S.Chand & Company, Ltd.
5. Organic Chemistry by Morrison – Boyd.
6. A Text Book of Organic Chemistry by K.S. Tiwari. S.N. Meharotra. N.K. Vishnoi. Vikas Publication, Meerut.
7. Spectroscopic methods in Organic Chemistry by Williams and Fleming. Mc-Graw Hill.
8. Stereochemistry of Organic Compounds by E.L. Eliel. Orient Longman.
9. Stereochemistry of Organic Compounds by P.S. Kalsi. New Age International Ltd.
10. A Guide Book to Mechanism in Organic Chemistry by Peter Sykes.
11. Advanced Organic Chemistry, structure, reactions and mechanism by Jerry March. Mc Graw Hill Kogakusha, Ltd.
12. Spectroscopy of Organic Compounds by P.S. Kalsi.
13. Absorption spectroscopy of Organic molecules by V.M. Parikh.
14. College Organic Chemistry Part I & II by G.R. Chatwal.
15. Stereochemistry by Nasi Puri.
16. Organic synthesis by Smith.

Semester-III
Paper-IV- Inorganic Chemistry

Total Credits : 3
(45 Contact hrs.)

1. Co-ordination Chemistry : (16)

1.1 Definition and formation of co-ordinate covalent bond in BF_3: NH_3 and in $[NH_4]^+$.

1.2 Distinction between double salt and complex salt,

1.3 Werner's theory : A. Postulates of theory,
B. Applications of theory:
Theory applied to cobalt amine viz;
a].CoCl3.6NH3 b] CoCl3.5NH3,c] CoCl3.4NH3, d]CoCl3.3NH3
C. Limitations

,

1.4 Description of terms –a] ligand, b]co-ordination number,
c] co-ordination sphere, d]effective atomic number,
e] Geometrical isomerism and optical isomerism in co-ordination compounds for CN = 4 and CN = 6.

1.5 IUPAC nomenclature of co-ordination compounds,

1.6 Valence bond theory of transition metal complexes.
A .Introduction
B. Postulates of VBT/ basic concepts of VBT
C. Role of transition metal in the formation of complex
D. Stepwise process of formation of complex : Salient featers
E. Applications : High spin and low spin complexes w.r.t. CN = 4 and CN = 6.
F. Limitations of Valence bond theory.

2. Chelation (07)

2.1 A brief introduction w.r.t. ligand, chelating agent, chelation and metal chelate.

2.2 Structural requirements of chelate formation.

2.3 Difference between metal chelate and metal complex.

2.4 Classification of chelating agents (with specific illustrations of bidentate chelating agent).

2.5 Applications of chelation w.r.t. chelating agents : EDTA and DMG.

3. Acids and Bases (07)

3.1 Lewis Concept : A.Definition, B.classification,C. merits and D.demerits.

3.2 Hard and soft acids and bases (HSAB) :
A. Classification of acids and bases as hard and soft,
B. Pearson's HSAB concept,
C. Acid-Base strength and hardness-softness,
D. Applications and limitations of HSAB principle.

4. Study of d-block elements (15)

5.1. Introduction,

5.2. Position of d-block elements in periodic table,

5.3.Names & electronic configuration of $1^{st,}$ 2^{nd} & 3^{rd} three transition series.

5.4. General Characteristics of 3 d-block elements w.r.t. –
a) oxidation state b) colour c) Magenetic behavior (spin only formula)
d) catalytic properties and e) tendency to form complexes.

5.5. Comparison of 1^{st} transition series with 2^{nd} & 3^{rd} transition series w.r.t. –

a) electronic configuration b) reactivity c) stability of oxidation state
d) magnetic behavior and e) stability of complexes (Brief account only)

Reference Books :

1. Concise Inorganic Chemistry by J.D. Lee ELBS 4^{th} & 5^{th} Edn.
2. Basic Inorganic Chemistry by F.A. Cotton, G.Wilkinson and P.L. Gaus Wiley.
3. Concepts and Models of Inorganic Chemistry by B. Douglas. D.Mc. Daniel and J. Alexander, John Wiley.
4. Advanced Inorganic Chemistry by Satyaprakash, Tuli, Basu (S. Chand and Co.)
5. Inorganic Chemistry by Puri and Sharma (S. Chand & Co.)
6. Inorganic Chemistry by Agrawal.
7. Industrial Chemistry by B.K. Sharma.
8. Environmental Chemistry by S.M. Khopkar (Wiley Eastern Ltd.)
9. Environmental Chemistry by A.K. De (Wiley Eastern Ltd.)
10. Inorganic Chemistry by D.E. Shriver, P.W. Atkins and C.H. Longford, Oxford.
11. Selected topics in Inorganic Chemistry : Madan, Malit Tuli, S. Chand & Company.
12. Environmental chemistry by B.K. Sharma.
13. Text book of Quantitative Inorganic Analysis by A.I. Vogel.
14. Vogel'sText Book of QuantativeInorganic Analysis–Bassett,Denny,Jefferyy Mendham.
15. Basic concepts of Analytical Chemistry by S.M. Khopkar.

Semester-IV
Paper-V- Physical Chemistry

Total Credits : 3
(45 Contact hrs.)

1. Electrochemistry : (17)

1.1. Introduction, conduction of electricity, Types of conductors : electronic and electrolytic.

1.2. Explanation of terms : Conductance, Specific resistance, specific conductance, Equivalent conductance, Molecular conductance.

1.3. Variation of specific and equivalent conductance with concentration, Equivalent conductance at infinite dilution. (Mention Onsager equation, $\lambda_v = \lambda_\infty - b\sqrt{c}$ from graph)

1.4. Migration of ions, Hittorf's rule, Transport number, Determination of transport number by moving boundary method, factors influencing transport number: Nature of electrolyte, concentration, temperature, complex formation and Degree of hydration.

1.5. Kohlrausch law, Applications of Kohlrausch law :

i. Determination of relationship between ionic conductance, ionic mobility and transport number.
ii. Determination of equivalent conductance at infinite dilution of weak electrolytes.
iii. Determination of degree of dissociation of weak electrolyte.
iv. Determination of ionic product of water.
v. Determination of solubility of sparingly soluble salts.

1.6. Numerical problems.

2. Thermodynamics (09)

2.1. Introduction, concept of entropy, Entropy as a state function: Definition, mathematical expression, unit, physical significance of entropy.

2.2. Entropy changes for reversible and irreversible processes in isolated systems.

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

2.4. Entropy change in mixing of gases.

2.5. Entropy change in physical transformations :

i. Fusion of a solid.
ii. Vaporization of a liquid.
iii. Transition from one crystalline form to another.

2.6. Third law of thermodynamics, Absolute entropy and Evaluation of absolute entropy, use of absolute entropies: Determination of entropy changes in chemical reactions.

2.7. Numerical problems.

3. The Solid State (10)

3.1. Introduction, space lattice, lattice sites, lattice planes, Unit Cell.

3.2. Laws of crystallography :

i. Law of constancy of interfacial angles.
ii. Law of rational indices
iii. Law of crystal symmetry.

3.3. Weiss indices and Miller indices.

3.4. Cubic lattice and types of cubic lattice, planes or faces of a simple cubic system, spacings of lattice planes.

3.5. Diffraction of X-rays, Derivation of Bragg's equation.

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

3.7. Numerical problems.

4. Physical Properties of Liquids (09)

4.1. Introduction, Additive and constitutive properties

4.2. Dipole moment, Electrical polarization of molecules.

4.3. Use of dipole moment in the study of molecular structure.

4.4. Refractive index, Snell's law.

4.5. Specific and Molecular refractivities; Abbe's refractometer : principle – Critical angle phenomenon, construction, working and advantages.

4.6. Molecular refractivity and chemical constitution, optical exaltation.

Reference Books :

1) Elements of Physical Chemistry : S. Glasstone and D. Lewis (D.Van Nostrand Co. Inc)
2) Physical Chemistry : W.J. Moore (Orient Longman)
3) Principles of Physical Chemistry : Maron & Prutton (Oxford IVth Edn.)
4) Chemistry Principle & Applications : P.W. Atkins, M.J. Clugsto, M.J. Fiazer, R.A.Y. Jone (Longman)
5) Physical Chemistry : G.M. Barrow (Tata Mc-Graw Hill)
6) Essentials of Physical Chemistry : B.S. Bahl & G.D. Tuli (S. Chand)
7) Physical Chemistry: Daniels – Alberty.
8) Principles of Physical Chemistry : Puri – Sharma (S. Nagin)
9) Basic Chemical Thermidynamics : V.V. Rao.
10) Physical Chemistry Through problems : Dogra and Dogra (Wiley Eastern Ltd.,)
11) Physical Chemistry: S. Glasstone.
12) Text book of Physical Chemistry – Samuel Glasstone (2^{nd} Edn. Mac Millan)
13) Elements of Physical Chemistry – P. Atkins & J. Paula (Oxford IVth Edn.)
14) Principles of Physical Chemistry : Puri, Sharma and Pathania
15) Electrochemistry : S. Glasstone

Semester-IV

Paper- VI- Analytical & Industrial Inorganic Chemistry

Total Credits : 3
(45 Contact hrs.)

1. Volumetric Analysis : (10)

1.1 Introduction, Terminology :- Titrant; Titrand, standard solution; Titration Indicator; Equivalence point; End point.Primary standard ,Secondary standard. Strength of solution, volumetric analysis & their types.

1.2 Acid Base Titration

i). Introduction

ii) Theory of Acid-Base indicator :

A) Colour change Interval

B) Theories-Ostwald's theory & Quinoid theory,

iii) Neutralization curve and choice of indicator for following titrations :

A) Strong acid and Strong Base

B) Strong Acid and Weak Base

C) Weak Acid and Strong Base

1.3 Complexometric titration :

A) General account ,

B) Types of EDTA Titrations (in detail direct titration) ,

C) Metallochromic Indicator w.r.t. Eriochrome Black-T

2. Gravimetric Analysis: (10)

2.1. Introduction

2.2. Precipitation – Conditions of Precipitation
Physical nature of Precipitate.

2.3. Process of precipitation – i) Nucleation ii) Crystal growth iii) Digestion

2.4. Coprecipitation and Post precipitation

2.5. Role of Organic precipitants in gravimetric analysis –
i) DMG ii) Aluminon iii) 8- hydroxyl quinoline.

3.Catalysis : (06)

3.1 Introduction;

3.2 Classification of catalytic reactions : Homogeneous & Heterogeneous

3.3 Types of catalysis;

3.4 Characteristics of catalytic reactions;

3.5 Mechanism of catalysis :
i) Intermediate compound theory
ii) Adsorption theory.

3.6 Industrial applications of catalysis.

4.Water Pollution & its Treatment (07)

4.1. Introduction: Resources of water, Types of water Pollutants, water Pollution and its sources (Brief Account)

4.2. Treatment of water :

A. Potable Water : Parameters of potability of water

Step I : Removal of suspended matter :

a) Prolonged storage b) Screening

c) Sedimentation d) Coagulation

e) Filtration

Step II : Removal of germs & bacteria- Physical & Chemical method.

Physical Methods : a) Boiling b) Exposure to UV or Sunlight
c) Distillation.

Chemical Method : a) Chlorination b) Fluorination
c) Ozonisation d) Aeration
e) Use of $KMnO_4$

B. Industrial Water : Mention names of methods only,
Ion exchange method in detail.

C. Munciple Sewage : Meaning of Sewage; Mention the names of methods;
Activated sludge process in detail.

5. Industrial heavy Chemicals **(07)**

5.1. Introduction

5.2. Physicochemical Principles & manufacture of following

i) Ammonia by Haber process

ii) Sulphuric acid by contact process.

6. Steel **(05)**

6.1. Definition,

6.2. Types of Steel.

6.3. Manufacture of Steel – a) Bessemer process b) L. D. rocess

6.4. Heat treatment on steel.

Reference Books :

1. Concise Inorganic Chemistry by J.D. Lee ELBS 4^{th} & 5^{th} Edn.
2. Basic Inorganic Chemistry by F.A. Cotton, G.Wilkinson and P.L. Gaus Wiley.
3. Advanced Inorganic Chemistry by Satyaprakash, Tuli, Basu (S. Chand and Co.)
4. Inorganic Chemistry by Puri and Sharma (S. Chand & Co.)
5. Inorganic Chemistry by G.S. Manku Tata Mc. Graw Hill.
6. Inorganic Chemistry by Agrawal.
7. Industrial Chemistry by B.K. Sharma.
8. Environmental Chemistry by S.M. Khopkar (Wiley Eastern Ltd.)
9. Environmental Chemistry by A.K. De (Wiley Eastern Ltd.)
10. Inorganic Chemistry by D.E. Shriver, P.W. Atkins and C.H. Longford, Oxford.
11. Environmental chemistry by B.K. Sharma.
12. Text book of Quantitative Inorganic Analysis by A.I. Vogel.
13. Vogel's Text Book of Quantative Inorganic Analysis – Bassett, Denny, Jefferyy Mendham.
14. Basic concepts of Analytical Chemistry by S.M. Khopkar.

Laboratory Course (Practicals) Physical Chemistry

University practical Examination : 140 marks

Internal practical Examination : 60 marks

Total 200 Marks = Credits : 4

B.Sc.II-Chemistry practical Exaimination-pattern
Mark Distribution

* University Examination : (Two Day Exam)	Expt	Journal	Oral	Total
Q.1: Physical Chemistry Experiment	35	5	5	45
Q.2 : Inorganic Chemistry Experiment	40	5	5	50
Q.3 : Organic Chemistry Experiment	35	5	5	45

*** Internal Examination :**

Practical paper has 60 marks for Internal Examination.

There will be **three** practicals of 20 marks each.

1. Physical Chemistry Expt : 20 marks
2. Inorganic Chemistry Expt : 20 marks
3. Organic Chemistry Expt : 20 marks

Note : i) Use of Electronic / Single pan balance / Digital balance is allowed.
ii) Use of scientific calculator is allowed.
iii) Use S.I. Units wherever possible.

A) Instrumental

1. Viscosity : To determine the percentage composition of a given liquid mixture by viscosity method. (Density data be given)
2. Refractometry : To determine the specific and molar refractions of benzene, tolyene and xylene by Abbe's refractometer and hence determine the refraction of $–CH_2$ group. (Densities should be determined by the students.)
3. Polarimetry : To determine the specific rotation and find unknown concentration of sugar solution.
4. Conductometry : (any two)
   i. To determine degree of dissociation and dissociation constant of acetic acid at various dilutions and to verify Ostwald's dilution law conductometrically.
   ii. To determine the normality of the given strong acid by titrating it aginst strong alkali conductometrically.
   iii. To determine the equivalent conductance at infinite dilution of strong electrolyte at five different dilutions conductometrically. (e.g. any one from KCl, NaCl, KNO_3 and HCl) and verify Onsager equation.

B) Non-Instrumental

1. Chemical Kinetics (ANY THREE)

i. To study the hydrolysis of methyl acetate in presence of HCl and H_2SO_4 and to determine the relative strong of acids.
ii. To study the effect of acid strength (0.5M and 0.25M HCl) on hydrolysis of an ester.
iii. To study the reaction between $K_2S_2O_8$ and KI (unequal concentration)
iv. To study the reaction between $KBrO_3$ and KI (equal concentractions)

Reference Books :

1. Experimental Physical Chemistry by A. Findlay Longman.
2. Experiments in Physical Chemistry by R.C. Das & B. Behra. Tata Mc Graw Hill.
3. Advanced Experimental Chemistry Vol. I Physical by J.N. Gurtu and R. Kapoor S. Chand & Co.
4. Experiments in Physical Chemistry by J.C. Ghosh, Bharati Bhavan.
5. Practical book of Physical Chemistry – by Nadkarni Kothari Lawande. Bombay Popular Prakashan.
6. Systematic Experimental Physical Chemistry – by S.W. Rajbhoj, Chondhekar. Anjali Publication.
7. Practical Physical Chemistry – by B.D. Khosala & V.C. Garg R. Chand & Sons.
8. Experiments in Chemistry by D.V. Jagirdar.

Practical Course Inorganic Chemistry

1. **Gravimetric Analysis :**
   i. Gravimetric estimation of Fe as Fe_2O_3 from a solution containing ferrous a Ammonium sulphate and free sulphuric acid.
   ii. Gravimetric estimation of Ba as $BaSO_4$ from a solution containing barium chloride and free hydrochloric acid.

2. **Titrimetric Analysis :** Calibration of burette, pipette and volumetric flask.
   i. Fertilizer analysis : To determine the percentage of nitrogen present in a given sample of nitrogenous fertilizer.
   ii. Quality control – To determine percentage purity of soda ash in the given sample.
   iii. Analysis of commercial vinegar – To determine the percentage of acetic acid is a given commercial sample of vinegar.

3. **Inorganic Preparations :**
   i. Ferrous Ammonium Sulphate (Mohr's salt)
   ii. Tetrammine Copper (II) sulphate

4. **Semi-micro Qualitative Analysis :**
   Cations : Cu^{++}, Al^{+++}, Fe^{+++}, Mn^{++}, Zn^{++}, Ni^{++}, Ba^{++}, Ca^{++}, Mg^{++}, NH_4^+, K^+
   Anions : Cl^-, Br^-, I^-, SO_4^{2-}, NO_3^-, CO_3^{2-} At least **SIX** mixtures to be completed.

Reference Books :

1. Quantative Inorganic Chemistry – A.I. Vogel.
2. Practical Chemistry – Physical – Inorganic – Organic and Vice-voce by Balwant Rai Satija. Allied Publishers Pvt. Ltd.
3. Inorganic Qualitative Analysis – A.I. Vogel.
4. Basic Concepts in Analytical Chemistry – S.M. Khopkar.

Laboratory Course Organic Chemistry

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 :** α– naphthol, o-nitrophenol, p-nitrophenol
- **Bases :** o-, m-, and p-nitroanilines N, N-dimethylaniline
- **Neutral :** urea, acetanilide, carbontetrachloride, bromobenzene, methylacetate, nitrobenzene, naphthalene, anthracene, acetophenone, ethylmethyl ketone.

Note : A systematic study of an organic compound involves the following operations which should be taught in details with reactions in the determination of elements and functional group.

1) Preliminary tests and physical examination
2) Determination of type
3) Determination of physical constant
4) Detection of elements
5) Determination of functional group
6) A search into the literature
7) Special test if any
8) Summary
9) Result.

B) Organic Quantitative Analysis :

i. Estimations (Any Two)

1. Estimation of ester
2. Etimation of acetone
3. Estimation of aspirin from aspirin tablet

ii. Organic Preparations (Any Three)

1. Preparation of phthalimide from phthalic anhydride.
2. Preparation of p-bromoacetanilide from acetanilide.
3. Preparation of m-dinitrobenzene from nitrobenzene using $NaNO_2$ and conc. H_2SO_4.
4. Preparation of acetanilide from aniline using acetic acid and anhydrous zinc chloride.
5. Preparation of p-nitroethylbenzoate from p-nitrobenzoic acid

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. Experiments in General Chemistry by C.N.R. Rao. Affiliated East-West Press Pvt. Ltd. Delhi.
6. Advanced Practical Organic Chemistry by N.K. Vishnoi. Vikas Publishing House Private Limited.
7. Comprehensive Practical Organic Chemistry Qualitative Analysis by V.K. Ahluwalia, Sunita Dhingra. University Press. Distributor-Orient Longman Ltd.
8. Practical Chemistry – Physical – Inorganic – Organic and Viva – voce by Balwant Rai Satija. Allied Publishers Private Limited.