

Solapur University, Solapur

Revised Semester Pattern Syllabus

B.Sc. Part – I (Chemistry)

(w.e.f. June, 2013)

**1) Title of the course : B.Sc. Part – I (Chemistry)
(Revised Semester I & II Syllabus)**

2) Introduction :

Chemistry is a fundamental science. The fundamental objectives of science are to make careful, qualitative or quantitative observations through purposive experimentation. The correct understanding and recording of observations is possible by understanding chemistry. Importance of accuracy, precision and reliability is confirmed & practiced through the knowledge of chemistry. It includes the knowledge of history, source, physical & chemical properties, structural effects, compounding, reactions & their rates & energetics, analytical techniques, preparations, applications of elements & compounds etc. Chemistry is of utmost need almost in every field of life. Our basic needs food, clothing & shelter are fulfilled through chemistry only. Carbohydrates, Proteins, Fats & Oils, Minerals, Vitamins etc are molecules of life. The clothes we wear, the dyes that colour them, the soaps & detergents used as cleansers are chemicals only. Many of the structural materials in our houses & furniture as well as paints & varnishes used for their finishing are all chemical compounds.

The study of chemical Kinetics, Thermodynamics Gaseous state are important branches of physical Chemistry. Mathematical concepts are required for the analytical studies in chemistry.

Chemistry makes sense, that there are relationships, trends & similarities in chemical behavior which can be understood in terms of chemical bonding, ionic solids, atomic structure & periodic properties. Metallurgy helps to understand extraction, refining of metals from their ores & uses of metals.

The study of the fundamentals of organic reaction mechanism helps to understand the details of the pathways followed by the chemical reactions. Stereoisomers differ substantially in chemical, physical, physio-chemical and

biochemical properties including chemical reactivities. Hence stereochemistry has become significant in organic chemistry & in biochemical reactions which are vital for life processes. The chapters on alkanes, alkenes, cycloalkanes, dienes, alkynes & benzene help to understand physical & chemical behavior of these classes of compounds with basic organic chemistry involved in them. The chapter on structure & bonding explains the concepts of formation of organic molecules & throws light on the reactivity of molecules based on structural variations.

The study of chemistry provides various analytical techniques used for qualitative and quantitative analysis of samples depending on physical and chemical properties of substances. The learners develop skills of analytical thinking. Analytical chemistry and practicals in chemistry enable the students to acquire and develop the ability to apply the knowledge of facts, concepts, principles, techniques relating to the subject in new and unknown situations. Chemistry is involved in our day to day life through water, food, medicines etc. Environmental chemistry makes the learners aware of pollution & terms related to pollution.

This course provides a broad overview of fundamental concepts of chemistry & helps to understand complexities and diversities of chemical behavior.

3) Objectives of the Course :

- 1) To enable the students to acquire the knowledge of terms, concepts, facts, processes, techniques & principles relating to the subjects.
- 2) To develop the ability to apply the knowledge of contents and principles of chemistry in new or unfamiliar situations.
- 3) To develop skills required in chemistry such as manipulative skills in the proper handling of apparatus and chemicals.
- 4) To expose the students to various emerging new areas of chemistry and apprise them with their relevance in their future studies.
- 5) To develop problem solving skills in students.
- 6) To expose the students to different processes used in industries & their technological applications.
- 7) To equip students to face various changes related to health, nutrition environment, population, weather, industries and agriculture by way of developing proper attitude towards the subject.

- 8) To apprise students with interface of chemistry with other disciplines of science such as Physics, Botany, Zoology, Geology, Engineering, etc.

4) Advantages of the Course :

Chemistry being the basic science, a degree in chemistry can prepare students for a wide variety of careers.

- 1) Chemistry graduates are hired to work in the chemical industry either as chemists working in the plant or on the bench as research chemist, production chemist, Q A and Q C officers etc.
- 2) Chemists are technically knowledgeable people who can work in the business side of the company. e.g. in sales, marketing, technical service etc.
- 3) Chemistry graduates can serve primary schools, high schools as teachers & after post graduation can serve college or university as lecturers, professors etc.
- 4) Chemistry graduates & post graduates can opt for research work in various fields. Faculty with Ph.D are expected to teach as well as direct research groups in ground breaking research. They can work in research and development (R & D) departments.
- 5) Chemistry graduates can opt for support services such as lab technicians, stockroom managers, safety officers, etc.
- 6) Government careers in national, state labs and agencies as analyst, food inspectors sanitary inspectors, officers in pollution control departments RAW, CBI wings etc.
- 7) An undergraduate degree in chemistry opens a whole host of opportunities in fields as varied as medicine, law, business, science etc.
 - Health Professions: Pharmacists, assistant for doctors, dentists, veterinarians etc.
 - Related Fields of Science: Forensic chemists, Biotechnologists, Toxicologists, Environmental Food Chemists, Cosmetics people, dyers, Officers and technicians in hazardous waste management, materials science, oceanography, paper and pulp industry, perfume industry, pharmaceuticals, plastics, polymers, metallurgy, alloys, food chemistry, geochemistry, forensic science,

surface chemistry, textile chemistry, agrochemistry, biotechnology, catalysis, ceramics, colloidal science and many many more

- Chemical Information Specialists: for scientific writing, scientific librarians, abstracting database production, museums, military systems, communicative technologies
- Intellectual Property: Patent agent, Patent Lawyer, Social Workers etc.

5) Eligibility of course:

For admission into bachelor's degree one should pass higher secondary school certificate examination i.e. H.S.C. science or 12th science or equivalent examination from a recognized board.

6) Duration:

The duration for B.Sc. degree course is of 3 years with semester pattern of 6 semesters.

- B.Sc- Part-I: I & II Semester
- B.Sc- Part-II: III & IV Semester
- B.Sc- Part-III: V & VI Semester

7) Medium of Instruction: English

8) Structure of the course:

- Structure of B.Sc. course in faculty of science has total of 06 semesters for 3 years.
- B.Sc.-I comprises of total two semesters. In each semester there will be two theory papers having weightage of 50 marks each.
- Paper I and II ----- Semester-I
- Paper III and IV----- Semester-II
- At the end of academic year i.e. semester II the practical examination is conducted which is based on theory papers I, II, III and IV. The Weightage of practical is of 50 marks.

Solapur University, Solapur
Revised Semester Pattern Draft Syllabus
For B. Sc. PART- I (Chemistry) In force from June, 2013

General Structure:

A) Theory: There will be two theory papers of 50 marks for each semester.

Semester-I

Theory paper will have two Papers their titles & distribution of marks will be as under.

Chemistry Paper - I (Physical Chemistry). -- 50 Marks

		Periods	
1) Chemical Kinetics	-	17	
2) Mathematical Concepts	-	06	
3) Thermodynamics	-	05	
4) Gaseous State	-	09	

Total - 37 Periods

Chemistry Paper – II (Inorganic Chemistry). -- 50 Marks

		Periods	
1) Atomic Structure and Periodic Properties	-	09	
2) Covalent bonding : VBT approach	-	10	
3) Covalent bonding : MOT approach	-	10	
4) Ionic Solids	-	09	

Total - 38 Periods

Semester-II

Chemistry Paper - III (Organic Chemistry). -- 50 Marks

		Periods	
1) Fundamentals of Organic reaction mechanism	-	06	
2) Stereo Chemistry of Organic compound	-	06	
3) Alkanes and Cycloalkanes	-	04	
4) Alkanes, Dienes and Alkynes	-	08	
5) Aromaticity of benzenes	-	06	
* 6) Structure & bonding	-	07	

Total - 37 Periods

Chemistry Paper-IV (Analytical Chemistry) -- 50 Marks

		Periods	
1) Physical properties of liquids	-	07	
2) Distribution Law	-	05	
3) Metallurgy	-	06	
4) Environmental Chemistry	-	04	
5) Qualitative and Quantitative elemental analysis	-	08	
6) Chemistry in day to day life	-	08	

Total – 38 Periods

Total Periods for Sem. I & II = 150

B.Sc. Part- I Chemistry Syllabus

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

Semester – I

Chemistry Paper- I (Physical Chemistry)

50 Marks

1. Chemical Kinetics

(16)

1.1 Chemical Kinetics and its scope, Rate of reaction, Definition and units of rate constant. Factors affecting rate of reaction. Concentration, pressure, temperature and catalyst.

1.2 Order and Molecularity of reaction.

1.3 First order reaction: Derivation of Rate constant. Characteristics of first order reaction.

Examples: Decomposition of N_2O_5

1.4 Second order reaction: Derivation of rate constant for equal and unequal concentration of the reactants. Characteristics of Second order reaction.

Examples : i) Reaction between $K_2S_2O_8$ and KI .

1.5 Pseudounimolecular reactions such as Hydrolysis of methyl acetate in presence of Acid.

1.6 Methods to determine the order of reaction:

- a) Integration method
- b) Graphical method
- c) Half change method
- d) Ostwald's isolation method

(Numerical Problems Expected)

2. Mathematical Concepts **(06)**

2.1 Graphical representation : Graph paper, co-ordinates of a point, equation of straight line and intercept, plotting of graph based on experimental data.

2.2 Derivative : Rules of differentiation (without proof) pertaining to algebraic and exponential functions. Example related to chemistry.

2.3 Integration : Rules of Integration (without proof) pertaining to algebraic and exponential functions. Example related to chemistry.
(Numerical Problems not expected)

3. Thermodynamics : **(05)**

3.1 Spontaneous & non spontaneous processes, Second law of thermodynamics and its different statements.

3.2 Carnot's Theorem (Heat engine), Carnot cycle and its efficiency.
(Numerical Problems Expected)

4. Gaseous State : **(10)**

4.1 a) Ideal and Non ideal gases

b) Deviation from ideal behaviour. (Only Boyle's law)

c) Causes of deviation, van der Waal's equation, explanation of real gas behaviour by van der Waal's equation.

4.2 Critical Phenomena : PV-Isotherms of real gases (Andrew's isotherms), continuity of state, Relationship between critical constants and van der Waal's constants.

4.3 Liquification of gases, Joule-Thomson effect.
(Numerical Problems expected)

Reference Books :

1) Mathematical preparation of Physical Chemistry : F. Daniel Mc-Graw Hill Book Com.

2) Elements of Physical Chemistry : S. Glasstone and D.Lewis (D.Van Nostrand Co.Inc)

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

4) Principles of Physical Chemistry : Maron Prutton

5) University Chemistry : B. H. Mahan (Addision - Weseley Publ. Co.)

6) Chemistry Principle & Applications : P.W. Atkins, M. J. Clugsto,
M.J. Fiazer, R. A. Y. Jone (Longman)

7) Physical Chemistry : G. M. Barrow (Tata Mc-Graw Hill)

- 8) Essentials of Physical Chemistry : B. S. Bahl & G.D. Tuli (S. Chand)
- 9) Physical Chemistry : A. J. Mee.
- 10) Physical Chemistry : Daniels - Alberty.
- 11) Principles of Physical Chemistry : Puri - Sharma (S. Nagin)
- 12) Text Book of Physical Chemistry : Soni Dharmarha
- 13) University General Chemistry : CNR. Rao (McMillan)
- 14) Chemistry : Sienko - Plane (Recent Edn.,)
- 15) Physical Chemistry Through problems : Dogra and Dogra (Wiley Eastern Ltd.,)
- 16) Physical Chemistry : S. Glasstone.
- 17) Basic Chemical Thermodynamics : V. V. Rao.

Chemistry Paper-II (Inorganic Chemistry)**50 Marks****1. Atomic Structure and periodic properties****(09)**

1.1 Atomic Structure

- Shapes of s, p, d orbitals.
- Aufbau and Pauli's exclusion principle, Hund's rule of maximum multiplicity
- General electronic configuration of s and p block elements.

1.2 General Characteristics of s and p block elements w.r.t. Atomic and Ionic radii, Ionisation energy, Electron affinity Electronegativity, Reactivity, Melting and Boiling point.

2. Covalent Bonding: Valence Bond Theory(VBT) Approach (10)

2.1 Valence Bond Theory: Heitler – London Theory and Pauling Slater Theory

2.2 Limitations of VBT

2.3 Need of Hybridisation

2.4 Types of hybridization and shapes of simple inorganic molecules: BeCl_2 , BF_3 , SiCl_4 , PCl_5 , SF_6 , IF_7 .2.5 Valence Shell Electron Pair Repulsion (VSEPR) Theory w.r.t. NH_3 , H_2O , ClF_3 **3. Covalent Bonding: Molecular Orbital Theory(MOT) Approach (10)**

3.1 Atomic and Molecular orbitals.

3.2 L.C.A.O. Principle

3.3 Bonding, Antibonding and Nonbonding Molecular orbitals.

3.4 Conditions for successful overlap

3.5 Different types of overlap.

s-s, s-px, px - px and py- py or pz- pz

3.6 Energy level sequence of molecular orbitals for $n = 1$ and $n = 2$

3.7 M. O. Diagrams for -

- Homonuclear diatomic molecule. H_2 , Li_2 , Be_2 , C_2 , N_2 and O_2
- Heteronuclear diatomic molecules CO and NO w.r.t. bond order stability

and magnetic properties.

4. Ionic Solids**(09)**

4.1 Ionic Bonding

- Formation of ionic bond, Energetics of ionic bonding : Ionisation potential, Electron affinity and Lattice energy.
- Characteristics of ionic compounds.
- Born-Haber Cycle for Alkali metal halide (NaCl).
(Numerical Problems are expected)
- Fajan's rules.

4.2 Radius ratio and crystal structure.

- a) Definition: Radius ratio (r_+ / r_-), Coordination number, Stoichiometry and unit cell.
- b) Concept and calculation of radius ratio (r_+ / r_-) for ionic solid with octahedral geometry.
- c) Radius ratio effect on geometry.
- d) Crystal structure of NaCl and CsCl w.r.t. unit cell, radius ratio, coordination number and stoichiometry.

Reference Books :

- 1) Advanced Inorganic Chemistry - Cotton and Wilkinson
- 2) Inorganic Chemistry - J. E. Huheey
- 3) Concepts and models of Inorganic Chemistry - Douglas & Mc-Daniel
- 4) Principles of Inorganic Chemistry - Puri, Sharma
- 5) New Concise Inorganic Chemistry - (ELBS) - J. D. Lee
- 6) Text book of Inorganic Chemistry - P. L. Soni
- 7) Advanced Inorganic Chemistry - Satyaprakash, Tuli, Basu
- 8) Theoretical Principles of Inorganic Chemistry - G. S. Manku
- 9) Principles of Inorganic Chemistry - Puri, Sharma & Kalia
- 10) Vogel's Text book of Quantitative Inorganic Analysis 4th Edition.
- 11) Instrumental Methods of Chemical Analysis 5th Edition (Analytical Chemistry) - Chatwal, Anand.
- 12) Chemistry - Central Science, Brown, Lemay, Bursten 8th Edition.
- 13) Principles of Soil Science - M. M. Raj, Millian Co. of India, Bombay 1977
- 14) Environmental pollution analysis - S.M. Khopkar
- 15) Industrial Chemistry - Rogers
- 16) Industrial Chemistry - R. K. Das

Semester – II

Chemistry Paper-III (Organic Chemistry)

50 Marks

1. Fundamentals of organic reaction mechanism

(06)

- 1.1 Meaning of reaction mechanism.
- 1.2 Curved arrow notation, Half headed and double headed arrows.
- 1.3 Types of bond breaking : Homolytic and Heterolytic.
- 1.4 Types of reagents : Electrophilic and Nucleophilic.
- 1.5 Types and sub-types of following organic reactions with definition and at least one example of each.
 - a) Substitution b) Addition c) Elimination d) Rearrangement.(Mechanism is not expected)
- 1.6 Reactive Intermediates with examples carbocations, carbanions (formation, structure, stability and reactions are expected). Carbon free radicals, carbenes, arenes, nitrenes (Definition with example only)

2. Stereochemistry of organic compounds

(06)

- 2.1 Types of stereo-isomerism - Optical isomerism, Geometrical isomerism and Conformational isomerism.
- 2.2 Chiral centre [Explanation with lactic acid]
- 2.3 Elements of symmetry
- 2.4 Optical isomerism in lactic acid, tartaric acid and 2,3 - dihydroxy butanic acid
- 2.5 Enantiomers and diastereoisomers.
- 2.6 Racemic modification.
- 2.7 Geometrical isomerism-cause of geometrical isomerism.
- 2.8 Geometrical isomerism w.r.t. $\begin{array}{c} \diagup \quad \diagdown \\ \text{C} = \text{C} \\ \diagdown \quad \diagup \end{array}$
Geometrical isomerism in maleic acid and fumaric acid.

3. Alkanes and Cycloalkanes

(04)

- 3.1 Alkanes : - Methods of formation with special reference to Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation of carboxylic acid.
- 3.2 Mechanism of free radical halogenation of alkanes.
- 3.3 Cycloalkanes - Nomenclature methods of formation (a) Internal Wurtz reaction (b) Distillation of calcium or barium salt of dicarboxylic acid.
- 3.4 Chemical properties of cyclopropane (i) Free radical substitution of chlorine in

presence of light. (ii) Action of HBr and conc. H_2SO_4 iii) Catalytic reduction by H_2/Ni

4. Alkenes, Dienes and Alkynes (08)

4.1 Nomenclature of alkenes.

4.2 Methods of formation of alkenes with mechanism

i) By dehydration of lower alcohols.

ii) By dehydrohalogenation of lower alkyl halides.

4.3 Chemical reactions of alkenes - Hydrogenation, Electrophilic and free radical additions, Hydroboration, Oxidation, Epoxidation, Ozonolysis, Hydration, Hydroxylation, Oxidation with KMnO_4 , Polymerisation of alkenes - ethylene and propylene

4.4 Nomenclature and classification of dienes.

4.5 Isolated, Conjugated and cumulated dienes.

4.6 Butadiene - Methods of formation, polymerisation, 1 : 2 & 1 : 4 additions and Diels-Alder reaction.

4.7 Alkynes - Nomenclature, Acidity of alkynes.

4.8 Electrophilic and Nucleophilic addition reactions, Hydroboration, oxidation.

5. Aromaticity and Benzene (06)

5.1 Meaning of the terms - Aromatic, non-aromatic, antiaromatic and psuedoaromatic compounds.

5.2 a) Kekule structure of benzene

b) Resonance structures of benzene.

c) Molecular orbital picture of benzene.

d) Representation of benzene ring.

5.3 Modern theory of aromaticity. Fundamental Concepts - delocalisation of electrons, coplanarity and Huckel's $(4n + 2) \pi$ rule. Applications of Huckel's rule to naphthalene, pyrrole, and pyridine.

5.4 Mechanism of electrophilic aromatic substitution in benzene w.r.t. nitration, sulphonation, halogenation and Friedel - Craft's reaction- alkylation and acylation.

6. Structure and Bonding (07)

6.1 Hybridisation : sp^3 , sp^2 and sp w.r.t. methane, ethylene and acetylene respectively.

6.2 Bond length, Bond angle and Bond energy with factors affecting these properties w.r.t. : sp^3 , sp^2 and sp hybridisation

6.3 Resonance effect with respect to phenol, and nitrobenzene.

6.4 Hyperconjugation w.r.t. toluene.

6.5 Inductive effect w.r.t. + I and - I .

6.6 Steric effect w.r.t. mesitoic acid.

Reference books

- 1) Organic Chemistry : Hendrickson, Cram, Hammond.
- 2) Organic Chemistry : Morrison & Boyd
- 3) Organic Chemistry : Volume I & II I.L. Finar
- 4) Organic Chemistry : Pine
- 5) Advanced Organic Chemistry : Sachinkumar Ghosh
- 6) Advanced Organic Chemistry : B.S. Bahl and Arun Bahl
- 7) A Guide book to Mechanism in organic Chemistry : Peter Sykes
- 8) Stereochemistry of Organic Chemistry : Kalsi,
- 9) Stereochemistry of Carbon Compounds : Eliel
- 10) Text book of Organic Chemistry : P. L. Sony
- 11) Practical Organic Chemistry : By A. I. Vogel
- 12) Advanced Organic Chemistry - Reactions, Mechanism & Structure : Jerry March
- 13) Organic Chemistry : M.R. Jain
- 14) Organic Chemistry : J. M. Shaigel

1. Physical properties of liquids (07)

- 1.1 Introduction, additive & constitutive properties.
- 1.2 Viscosity, coefficient of viscosity, determination of viscosity by Ostwald's Viscometer.
- 1.3 Surface tension:- Determination of surface tension by Drop –Weight method
- 1.4 Parachor:-Macleod equation & its modification by Sugden, applications of parachor in the determination of molecular structures as benzene, NO₂ group (Numerical problems not expected).

2. Distribution Law (05)

- 2.1 Nernst distribution law, Its limitations & modification with reference to association & dissociation of solute in one of the solvent.
- 2.2 Applications of distribution law in:
- a) Process of extraction (derivation expected)
 - b) Determination of solubility
 - c) Distribution Indicators
 - d) Determination of molecular weight
(Numerical problems expected)

3. Metallurgy (06)

- 3.1 Introduction :- Terms used in Metallurgy, Metallurgy, Mineral, Ore, Gangue, Flux, Slag
- 3.2 Occurrence of metals : Types of Ores.
- 3.3 Steps Involved in Metallurgical Processes :
- A) Concentration of Ores:
- i) Physical Methods:- a) Gravity separation method b) Magnetic separation method c) Froth floatation method.
 - ii) Chemical Methods : a) Calcination b) Roasting
- B) Reduction: Mention various methods of reduction. Extraction of Iron by blast furnace.

4. Environmental Chemistry (04)

- 4.1 Introduction: Meaning of terms : Environment, Pollution, Pollutant, Threshold Limit Value (TLV), Dissolved Oxygen (DO), Chemical Oxygen Demand. (COD) and Biological Oxygen Demand (BOD)

4.2 Types of Pollution (Only Introduction) :

Air pollution, Water pollution, Sound pollution, Soil pollution, Automobile pollution and nuclear pollution.

4.3 Air Pollution : Classification of Air pollutants, Oxides of carbon, Sulphur and Nitrogen as air pollutants with respect to source and health hazards.

5. Qualitative and Quantitative elemental analysis (08)

5.1 Qualitative analysis of Carbon, Hydrogen, Nitrogen & Sulphur

5.2 Quantitative analysis of -

- i) Carbon & hydrogen by Combustion method
- ii) Nitrogen by Kjeldahl's method
- iii) Halogen and by Carius method.

5.3 Determination of molecular weight of an acid by titration method .

5.4 Empirical formula and molecular formula determination. (Numerical Problems Expected)

6. Chemistry in day-to-day life (08)

6.1 Types of water, desalination, Fresh water, Dissolved Oxygen and water quality.

6.2 Milk: Definition, Chemical composition of milk of different species such as cow, buffalo and goat.

6.3 Adulteration in milk like Sugar, Urea, Starch.

6.4 Essential nutrients for plants, Classification, Major, minor & trace their sources and forms.

6.5 Importance of Inorganic Compounds as Medicine- Antacid products Na_2CO_3 , $\text{Al}(\text{OH})_3$, AlPO_4 , $\text{Mg}(\text{OH})_2$, Cis-Platin

Reference Books

- 1) Chemistry - Central Science, Brown, Lemay, Bursten 8th Edition.
- 2) Outline of Dairy Technology - Sukumar De Oxford university Press.
- 3) Introduction to Agronomy & soil water management - V. G. Vaidya, N.R. Sahastrabudhye.

- 4) Principles of Soil Science - M. M. Raj, Millian Co. of India, Bombay 1977
- 5) Inorganic Medicinal & Pharmaceutical Chemistry- Block, Roche, Soine – Wilson, Varghese Publishing House.
- 6) Environmental Chemistry - A.K. De
- 7) Environmental pollution analysis - S.M. Khopkar
- 8) Organic Chemistry : Hendrickson, Cram, Hammond.
- 9) Organic Chemistry : Morrison & Boyd
- 10) Organic Chemistry : Volume I & II I.L. Finar
- 11) Organic Chemistry : Pine
- 12) Advanced Organic Chemistry : Sachinkumar Ghosh
- 13) Advanced Organic Chemistry : B.S. Bahl and Arun Bahl
- 14) A Guide book to Mechanism in organic Chemistry : Peter Sykes
- 15) Stereochemistry of Organic Chemistry : Kalsi,
- 16) Stereochemistry of Carbon Compounds : Eliel
- 17) Text book of Organic Chemistry : P. L. Sony
- 18) Practical Organic Chemistry : By A. I. Vogel
- 19) Advanced Organic Chemistry - Reactions, Mechanism & Structure : Jerry March
- 20) Organic Chemistry : M.R. Jain
- 21) Organic Chemistry : J. M. Shaigel
- 22) Industrial Chemistry : Rogers
- 23) Industrial Chemistry : R.K.Das

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

- 1) Preliminary tests and physical examination.
- 2) Determination of physical constant.
- 3) Detection of Elements.
- 4) Determination of functional group.
- 5) A search into the literature.
- 6) Special Test.
- 7) Summary.
- 8) Result.

3) Organic Preparation: (Any one)

- i) Preparation of benzoic acid from benzamide.
- ii) Preparation of succinimide from succinic acid.
 - Wt. of crude product is expected.
 - M.P. of the recrystallized product is not expected.

Reference Books:

- 1) Vogel's Text Book of Quantitative Chemical Analysis, (Longman) ELBS. Edition
- 2) Vogel's Text Book of Qualitative Chemical Analysis, (Longman) ELBS. Edition
- 3) Hand book of Organic Qualitative Analysis : Clarke
- 4) Comprehensive Practical Organic Chemistry - Quantitative Analysis by V.K. Ahluwalia, Sunita Dhingra, University Press. Distributor - Orient Longman Ltd.,
- 5) Comprehensive Practical Organic Chemistry preparation and Quantitative Analysis. : V.K. Ahluwalia, Renu Agarwal, University Press. Distributor - Orient Longman Ltd.,
- 6) A laboratory Hand-Book of organic Qualitative Analysis and separation :V. S. Kulkarni, Dastane Ramchandra and Co. Pune

Inorganic Chemistry

A) Inorganic Quantitative Analysis :

- 1) Study of analytical balance and calibration of fractional weights.
- 2) Volumetric Analysis :
 - 2.1 To prepare a standard solution of Oxalic acid and determine the strength of Potassium permanganate solution in terms of normality and Kg/dm^3

- 2.2 To prepare standard solution of Potassium dichromate and determine strength of Ferrous Ammonium Sulphate solution in terms of normality and Kg/dm^3 (Use internal indicator)
- 2.3 To prepare standard solution of calcium chloride from calcium carbonate and determine the total hardness of given water sample.

B) Qualitative Analysis:

1) Spot Tests:

Detection of following cations using spot tests : Cu^{2+} , Co^{2+} , Ni^{2+} , Fe^{3+} , Zn^{2+} , Mg^{2+} , Al^{3+} , Pb^{2+} .

2) Chromatography :

Separation and identification of cations by Paper Chromatographic technique

From the following mixtures :

- a) $\text{Ni}^{2+} + \text{Cu}^{2+}$
- b) $\text{Ni}^{2+} + \text{Co}^{2+}$
- c) $\text{Cu}^{2+} + \text{Co}^{2+}$

Reference Books :

- 1) Vogel's Text Book of Quantitative Chemical Analysis (Longman ELBS Edition)
- 2) Vogel's Text Book of Qualitative Chemical Analysis (Longman ELBS Edition)
- 3) Basic Concepts in Analytical Chemistry (Wiley Eastern Ltd.) : S. M. Khopkar.



Solapur University, Solapur

Nature of Question Paper For Semester Pattern

□ Faculty of Science

(w.e.f. June 2013)

Time :- 2 hrs.

Total Marks-50

Q. No.1) Multiple choice questions. (10)

- 1) -----
a) b) c) d)
- 2)
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)
- 10)

Q.No.2) Answer any Five of the following (10)

- i)
- ii)
- iii)
- iv)
- v)
- vi)

Q.No.3) A) Answer any Two of the following (06)

- i)
- ii)
- iii)

B) Write the Answer/Solve/Problem/Note (04)

Q.No.4) Answer any Two of the following (10)

- i)
- ii)
- iii)

Q.No.5) Answer any Two of the following (10)

- i)
- ii)
- iii)

