University of Pune

Three Year B. Sc. Degree Course in

Chemistry

Title of the Course : B. Sc. Chemistry

F.Y.B.Sc. Chemistry

(To be implemented from Academic Year 2013-14)

AIMS AND OBJECTIVES

- F.Y. B. Sc. Chemistry syllabus has been revised as per BCUD directives.
- The content of the syllabus have been framed as per UGC norms.
- The students are expected to understand the fundamentals, principles, mathematical concepts and recent developments in the subject area.
- The practical course is in relevance to the theory courses to improve the understanding of the concepts.
- It would help in development of practical skills of the students.
- It is expected to inspire and boost interest of the students towards chemistry as the main subject.
- It would enable to develop interdisciplinary approach of the subjects for students opting for specialization in other subjects at latter stages of graduation.

2) Preamble:

The systematic and planned curricula from first year to the third year shall motivate and encourage the students for pursuing higher studies in various disciplines of Chemistry such as Physical, Inorganic, Organic, Analytical, Drug and Biochemistry. This curriculum also enable student to shoulder the responsibility as Chemist in chemical industry.

3) Introduction:

At **first year of under-graduation**The basic topics related to the fundamentals of chemistry covered. Since chemistry is an experimental subject, practical courses is intended to achieve the basic skills required for understanding the concepts and authenticating the basic laws and principles of Chemistry.

At **second year under-graduation**: The level of the theory and practical courses shall be one step ahead of the first year B.Sc. Courses based on content of first yearshall be introduced. For the development of vertical growth in the subject, advanced level topics are introduced so as to make the sudent mature enough to pursue the carrer in Chemistry.

At **third year under-graduation:**Theory papers in each semester deal with the further detailed studies of the various branches of Chemistry as well as some specialized topics like Industrial and Environmental Chemistry. Such a designing of course structure enables the student to understand fundamental as well as applied components that are pertinent to Chemistry. Also, practical courses are framed towards development of synthetic as well as analytical skills that are essential for academic and professional life.

Objectives:

- To provide indepth knowledge of scientific and technological aspects of Chemistry
- To familiarize with current and recent developments in Chemistry
- To enrich knowledge through programmes such as industrial visits, projects etc.
- To train students in skills related to Chemistry for academic and industrial requirement.
- To creat foundation for research and development in Chemistry
- To develop analytical abilities for independent thinking
- To help students build-up a progressive and successful career in Chemistry

4) Eligibility:

1 **First Year B.Sc.:**Higher Secondary School Certificate (10+2) Science stream or its equivalent Examinationas per the University of Pune eligibility norms.

2 **Second Year B.Sc.:** Keeping terms of First Year of B. Sc. with Chemistry as one of the subjects. Other sudents if they fulfill the conditions approved by the equivalence committee of Faculty of Science of the University of Pune are also eligible.

3 **Third Year B. Sc.:** Student shall pass all First Year B. Sc. courses and satisfactorily keeping terms of Second Year of B. Sc. with Chemistry as one of the subjects.

Note: Admissions will be given as per the selection procedure / policies adopted by the respective college, in accordance with conditions laid down by the University of Pune.Reservation and relaxation will be as per the Government rules.

5 A) Examination Pattern:

First Year B. Sc. Chemistry

Pattern of Examination: Annual

Theory courses C-1: Chemistry Paper I: Annual
C-2: Chemistry Paper II: Annual

Practical Course C-3: Chemistry Paper III: Annual

Paper/ Course No.	Title	Total Number of lectures/practicals per Term	Standard of passing		
			Internal marks out of **20**	External marks out of **80**	Total marks out of **100**
Paper-I (First term)	Physical and Inorganic Chemistry	Three lectures/Week (Total 36 lectures per term)	08	32	40 *
Paper -I (Second term)	Physical and Inorganic Chemistry	Three lectures/Week (Total 36 lectures per term)			

Paper - II (First term)	Organic and Inorganic Chemistry	Three lectures/Week (Total 36 lectures per term)	08	32	40 *
Paper -II (Second term)	Organic and Inorganic Chemistry	Three lectures/Week (Total 36 lectures per term)			
Paper -III (First & Second Term)	Practical	10 Practicals of 4 lectures in each term (20 practicals / year)	08	32	40 *

* Subject to compulsory passing in external examination and getting minimum 40 marks out of 100

Notes:

1. Total marks: Theory (100 + 100) = 200 marks
2. Total marks per year 200 (Theory) + 100 marks (practicals) = 300 marks
3. Internal marks for theory papers given on the basis of internal assessment tests and for practicals on internal assessment tests + journals + attendance + study visit reports/ market survey/hobby projects etc.

Theory examination will be of three hours duration for each theory course. There shall be 5 questions each carrying equal marks. The pattern of question papers shall be:

Question 1	8 sub-questions, each of 2 marks; answerable in 2 -3 lines and based on entire syllabus
Question 2, 3 and 4	4 out of 6– short answer type questions; answerable in 8 – 10 lines
Question 5	4 out of 6 – problem type question; answerable in numerical or analytical fashion

Internal examination: Internal assessment of the student by respective teacher will be based on written test, 10 marks each term. The written test shall comprise of objective type questions – Multiple Type Questions, True / False, Definitions, Answer in Two or three line question (Describe/Explain).There shall be 20 questions.
Practical: one internal assessment test + marks for journals + attendance + activity.

Practical Examination: Practical examination shall be conducted by the respective college at the end of the academic year. Practical examination will be of 6 hours duration (2-Sessions). Certified journal is compulsory to appear for practical examination. There shall be two expert and two examiners per batch for the practical examination.

5 B) Standard of Passing:

i. In order to pass in the first year theory examination, the candidate has to obtain 40 marks out of 100 in each course. (Minimum 32 marks out of 80 must be obtained in the University Theory Examination.)

ii. In order to pass in the Second Year and Third Year theory examination, the candidate has to obtain 20 marks out of 50 in each course of each semester. (Minimum 16 marks out of 40 must be obtained in the University Theory Examination.)
iii. In order to pass in practical examination, the candidate has to obtain 40 marks out of 100 in each course. (Minimum 32 marks out of 80 must be obtained in the University Examination.)

5 C) ATKT Rules:

While going from F.Y.B.Sc. to S.Y.B.Sc. at least 8 courses (out of total 12) should be passed.

5 D)Award of Class:

The class will be awarded to the student on the aggregate marks obtained during the second and third year in the principal subject only. The award of the class shall be as follows:

1	Aggregate 70% and above	First Class with Distinction
2	Aggregate 60% and more but less than 70%	First Class
3	Aggregate 55% and more but less than 60%	Higher Second Class
4	Aggregate 50% and more but less than 55%	Second Class
5	Aggregate 40% and more but less than 50%	Pass Class
6	Below 40%	Fail

5 E) External Students: There shall be no external students.

5 F) Setting question papers:

F.Y.B.Sc.: For theory papers I and II annual question papers shall be set by the University of Pune and assessment done at the respective colleges. Questions should be designed to test the conceptual knowledge and understanding of the basic concepts of the subject. For Practical Paper III,papers shall be set by the University of Pune and assessment done at the respective colleges.

5G)Verification and Revaluation Rules:
As per university Statues and rules for verification and revaluation of marks in stipulated time after declaration of the semester examination result.

6) Course Structure:

Duration: The duration of B.Sc. Chemistry Degree Program shall be three years.

a) Compulsory Papers:
F.Y.B.Sc. : 2 Theory + 1 Practical (Annual)

b) Question Papers :

F.Y.B.Sc.Theory paper:
University Examination – 80 marks (at the end of 2nd term)
Internal Examination – 20 marks
F.Y. B.Sc.Practical Paper:

University Examination – 80 marks (at the end of 2nd term)
Internal Examination – 20 marks

c) Medium of Instruction: The medium of instruction for the course shall be **English.**

7) Equivalence of Previous Syllabus:

Old Course (2008 Pattern)	**New Course (2013 Pattern)**
Paper I: Physical and Inorganic Chemistry	Paper I: Physical and Inorganic Chemistry
Paper II: Organic and Inorganic Chemistry	Paper II: Organic and Inorganic Chemistry
PaperIII: Practical	PaperIII: Practical

8) University Terms: Dates for commencement and conclusion for the first and second terms will be declared by the University authorities. Terms can be kept by only duly admitted students. The term shall be granted only on minimum 75 percent attendance at theory and practical course and satisfactory performance during the term.

9) Qualification of Teachers:M.Sc. Chemistry or equivalent master degree in science with class/grades and NET/SET as per prevailing University/Government /UGC rules.

Chemistry Paper - I

Physical and Inorganic Chemistry

Term - I

Chapter 1	States of Matter	08
Chapter 2	Surface Chemistry	08
Chapter 3	Chemical Mathematics	08
Chapter4	Mole Concept, Stoichiometric and Numerical, Oxidation- reduction	12

Term - II

Chapter 4	Atomic Structure	12
Chapter 5	Chemical Thermodynamics	12
Chapter 6	Chemical Bonding	12

Chemistry Paper - II

Organic and Inorganic Chemistry

Term - I

Chapter1	Chemical Bonding in Organic Molecules	12
Chapter 2	Chemistry of Hydrocarbons	12
Chapter 3	Chemistry of s-block elements	12

Term - II

Chapter 4	Chemistry of Functional Groups	12
Chapter 5	Stereochemistry	12
Chapter 6	Chemistry of p-block elements	12

Chemistry Paper - III

Practical Course

1. Physical Chemistry : 7 experiments
2. Inorganic Chemistry: 7 experiments
3. Organic Chemistry : 7 experiments

PAPER - I: PHYSICAL & INORGANIC CHEMISTRY

TERM - I

Chapter 1: States of Matter
(08)

Introduction: States of matter and their properties.
Gaseous states: Significance of ideal and kinetic gas equation (no derivation), Real gases-Compressibility factor, van der Waal's equation of state, Isotherms of CO_2, critical constants, correlation between critical constants and van der Waal's constants.
Liquid state – Properties of liquids , Comparison between gaseous and solid state – Experimental determination of vapor pressure by isoteniscopic method and viscosity by Ostwald method, liquid crystals and their applications.

Aims & Objectives:

I) This topic makes understanding of behavior of gases, ideal gas as a model system and its extension to real gases. The dependence of physical state on pressure, volume and temperature is being realized.

II) The existence of liquid state, comparison of its properties with other states is to be perceived. Liquid crystal are essentials in all common and research devices and instruments hence they are introduced briefly.

III) Student should be able to solve problems regarding van der Waal's and Critical constant and regarding P-V-T relations.

IV)

Chapter 2: Surface Chemistry (08)

Adsorption: Types of adsorption, adsorption isotherms, Freundluich isotherm, Langmuir isotherm, adsorption of gases on solids, adsorption of solutes on solids, applications of adsorption,
Catalysis : Phenomena of catalysis, types of catalysis-homogeneous and heterogeneous catalysis, gaseous reactions on solid surfaces.
Colloids: Definition and classification, preparation of emulsions, gels and sols, properties of suspensoids.

Aims & Objectives:

Theoretical basis of adsorption phenomena is integrated. Understanding dynamic nature of surface and its applications in catalysis and in dispersed phases will lead to new area of nanoscience.

Chapter 3: Chemical Mathematics (08)

Functions and variables: Variables as function , variables used in chemistry
Derivative: Rules of differentiation, examples on derivatives of algebraic, logarithmic and exponential functions, partial differentiation, conditions for maxima and minima, problems related to chemistry,

Integration: Rules of integration (algebraic, exponential and logarithmic functions), Integration –definite and indefinite, problems related to chemistry.
Graph: Plotting graphs of linear, exponential and logarithmic functions and their characteristics, sketching of s and p orbitals.

Aims & Objectives:

Mathematical background required for derivations, depictions and problem solving. This chapter strengthens these aspects.

Chapter 4: Mole Concept and Oxidation-reduction (12)

Mole concept-Determination of mol. Weight by gram molecular volume relationship, problems based on mole concept. Methods of expressing concentrations, strength, normality, molarity, molality, %w/v, %v/v, ppm, standardization of solutions, primary & secondary standard substances, Preparation of standard solution of acids & bases, problems related to acid base titrations only.

Oxidation & reduction-Definitions to related terms like oxidation, reduction, oxidizing agent, reducing agent, oxidation number, Balancing of redox reactions using oxidation number method & ion electron method, problems based one equivalent weight of oxidant & reductants.

Ref: 8, 9, 10 & 11

Aims and objectives-

Students should know

1) Mole concept

2) GMV relationship

3) Student should be able to solve problems based on GMV relationship.

4) Normality, Molarity, Normal solution, Molar solution, equivalent weight, ppm, %w/v, %v/v & related problems.

5) Standard solution, primary & secondary standard substances, standerdisation of solution & related problems.

6) Understand the concept of oxidation & reduction, oxidizing agent, reducing agent, redox reaction, oxidation number, Balance the equation by ion electron method & oxidation number method.

8) Calculation of Equivalent weight of oxidant & reductant.

Term - II

Chapter 4: Atomic Structure (12)

Introduction, atomic spectrum of hydrogen, Bohr model of hydrogen atom-derivation of atomic radius and energy, energy level diagram of hydrogen atom , Failure of Classical mechanics- black body radiation, photoelectric effect, electron diffraction, atomic spectra, quantization of energy, de Broglie's hypothesis, Heisenberg's uncertainty principle (without proof), wave equation, time independent Schrödinger equation, hydrogen atom (expressions only)., wave functions for s and p atomic orbitals,

Aims & Objective

Atom being most important micro particle in construction of matter, modern developments of its structure is presented. The quantization of energy and duality of matter in this context is elaborated . Schrodinger equation is the basis of quantum chemistry that has been introduced for simplest system hydrogen atom.

Chapter 5: Chemical Thermodynamics (12)

Introduction, first law of thermodynamics and its limitations, Carnot cycle and efficiency, Entropy and second law of thermodynamics, entropy as a state function, Entropy change in isolated system, reversible and irreversible process, entropy change in ideal gases – isothermal , isobaric , isochoric processes , entropy change in physical transitions , entropy change in chemical reactions, statistical definition of entropy, absolute entropy, third law of thermodynamics

Aims & Objectives:

Natural changes are understood with the help of second and third laws of thermodynamics . These laws are presented with the help of state function entropy. Entropy changes in various processes and under various conditions have been discussed.

Chemical bonding (12)

Attainment of stable configuration, Types of bonds ionic, covalent, co-ordinate & metallic, Types of overlaps: s-s, p-p, s-p, p-d, d-d and their examples, Formation of sigma & pi bonds, Theories of bonding- a)valance bond theory, b) Heitler London theory and c) Pauling Slater theory, Concept of hybridization: Definition & need of hybridization, steps involved in hybridization, explanation of covalency of atoms in the moles based on hybridization, types of hybridization involving s, p, & d orbitals.

Applications of hybridization geometries of molecules like

i) BeH_2 ii) BF_3 iii) $[MnCl_4]^{2-}$ iv) $[Ni(CN)_4]^{2-}$ v) $Fe(CO)_5$
vi) $[Cr(H_2O)_6]^{2+}$ vii) IF_7

VSEPR theory: Assumptions, need of theory, application of theory to explain geometry of irregular molecules

i) ClF_3 ii) Cl_2O iii) BrF_5 iii) $TeCl_4$ iv) XeO_3 v) $XeOF_4$

Ref. 12, 13, 14 & 15

Aims and objectives:

Student should understand:

1. Basic principle of overlapping of atomic orbital with specific shapes and sizes
2. Fundamental concepts of theories of overlapping of atomic orbitals
3. Concept of hybridization and differentiation with overlap
4. Concept of different types valence shell electron pairs and their contribution in bonding
5. Application of non-bonded lone pairs in shape of molecule
6. Basic understanding of geometry and effect of lone pairs with examples

References books for Physical Chemistry

1. Physical Chemistry-P.W. Atkins ELBS, 5th edition
2. Principles of Physical Chemistry By S. H. Maron and C. F. Prutton ,4th edition
3. Physical Chemistry by S. Glasstone.
4. Physical Chemistry – Silbey Alberty, Bawendi, Wieley India .
5. Quantum Chemistry – I. Levine, Fifth edition, Prentice Hall-1999
6. Essentials of Physical Chemistry – Bahl, Tuli., S. Chand and Company Ltd.
7. Physical Chemistry of Surfaces – A. W. Adamson, John Wiley and sons , 5th edition.
8. Mathematical preparation of Physical Chemistry by F. Daniel, Mc Graw Hill Publication

PAPER - II: ORGANIC & INORGANIC CHEMISTRY

TERM - I

Chapter1: Chemical Bonding, structure and reactivity of Organic Molecules (14)

Covalent bond, Hybridization - sp, sp^2 and sp^3 hybridization, Bond length, Bond angle, Bond energy, Inter and Intra molecular forces and their effects, Drawing organic molecules, zig-zag structures, Lewis structure and formal charge, Arrow pushing concept, Structural effects - Inductive effect, Steric effect, Resonance effect, Hyper-conjugation, Tautomerism, Applications of structural effects - Strength of acids and bases, pKa and pK_b values of common organic acids and bases.

Ref. 1, 2, 3 & 4

Covalent bond, Hybridization - sp, sp^2 and sp^3 hybridization, Bond length, Bond angle, Bond energy, Inter and Intra molecular forces and their effects
Ref. 2: Pages 9 - 17, 20 - 29
Drawing organic molecules, zig-zag structures, Lewis structure and formal charge
Ref. 1: Pages 31 - 36, 116 - 127
Arrow pushing concept, Structural effects - Inductive effect, Steric effect, Resonance effect, Hyper-conjugation, Tautomerism, Applications of structural effects - Strength of acids and bases, pKa and pK_b values of common organic acids and bases
Ref. 1: Relevant Pages between 181 - 201
Ref. 2: Pages 33 - 35, 200, 406 - 407
Ref. 3: Pages 20 - 28

Aims and Objectives:-

The student is expected to know:

1. The fundamental concepts which govern the structure, bonding, properties and reactivities of organic molecules such as covalent character, hybridization, bond angles, bond energies, bond polarities and shapes of molecules.
2. Drawing of organic molecules and arrow pushing concept.
3. Acid-base theories, pKa / pKb values for common organic acids and bases and factors affecting strength of acids and bases.
4. Structural effects and their applications in determining strength of acids and bases.

Chapter 2: Chemistry of Hydrocarbons (10)

Introduction, Nomenclature, Physical properties, General methods for preparation, Chemical reactions of-Alkanes, alkenes , alkynes and introduction to homocyclic and polycyclic aromatic hydrocarbons (benzene, naphthalene, anthracene), Huckel's rule of aromaticity.

Ref. 1, 2, 3 & 4

Alkanes - Introduction, Nomenclature, Physical properties, Preparations, Reactions of alkanes, Analysis of Alkanes
Ref. 2: Sec. 2.1 – 2.3, Sec. 3.6 – 3.12, Sec. 3.15 – 3.17, Sec. 3.18, 3.19, 3.30, 3.32, Sec. 3.34
Pages: 39 – 41, 86 – 94, 97 – 106, 118, 120, 122
Alkenes - Introduction, higher alkenes, Nomenclature, Physical properties, Preparations, Reactions of alkenes, Analysis of Alkenes
Ref. 2: Sec. 8.7 to 8.9, 8.11 to 8.13, Sec. 9.1, 9.2, 9.27
Pages: 282 – 285, 287 – 293, 309, 317 – 323, 360 - 362

Dienes - Structure & Properties, Conjugated dienes, Reactions of dienes, Analysis of dienes
Ref. 2: Sec. 11.17, 11.19, 11.21, 11.22, 11.26
Pages: 409 – 417, 421, 422

Alkynes: Introduction, Nomenclature, Physical properties, Preparation, Reactions & analysis of alkynes
Ref. 2: Sec. 12.1 - 12.8, 12.14

Pages: 425 – 434, 440

Introduction to homocyclic and polycyclic aromatic hydrocarbons (benzene, naphthalene, anthracene), Huckel's rule of aromaticity, Reactions of benzene, Naphthalene and Anthracene – Sulphonation, Nitration, Halogenation, Friedle Craft reactions

Ref. 2: Sec. 14.1 - 14.5, 14.10, 14.11, 14.12, Relevant pages from 15.1 – 15.21

Pages: 493 – 499, 504, 508 – 511, Relevant pages from 517 - 546

Aims and Objectives:-

The student is expected to know

1. The common and IUPAC names of alkanes, alkenes, alkynes and homocyclic, polycyclic aromatic hydrocarbons.
2. Methods of preparation and chemical reactions of alkanes, alkenes, alkynes and homocyclic, polycyclic aromatic hydrocarbons.
3. Application of Huckel's rule to different organic compounds to find out aromatic /non aromatic characters.
4.

Chapter 3: Chemistry of s-block Elements (12)

Recapitulation of periodic table, special position of hydrogen in the long form of the periodic table, properties of s-block elements w.r.t. electronic configuration, extraction, trends and properties, Introduction to crown ethers and cryptans, separation of s-block elements using crown ethers, Compounds of s-block elements: oxides, hydroxides, peroxides, superoxides, Application of s-block elements in industrial, biological and agricultural fields.

Ref. 6 & 9

Aims and objectives:
Student should learn

1. Skeleton of long form of periodic table
2. Quantum numbers
3. Shells, sub-shells, types of orbital and their shapes
4. Afbau, Paulin's exclusion principle and Hunds rule
5. Block, group, periodic law and periodicity
6. Name, symbol, electronic configuration, trends and properties
7. Crown ether and cryptans
8. Separation of s-block elements with crown ethers
9. Compounds of s-block elements: oxides, hydroxides, peroxides and superoxides
10. Application of s-block elements: Industrial, biological and agricultural field

TERM - II

Chapter 4: Chemistry of functional groups (14)

Introduction, Nomenclature, Physical properties, General methods for preparation, Chemical reactions of: Alkyl halides, alcohols, phenols, ethers, aldehydes, ketones, carboxylic acids, amines.

Ref. 1, 2, 3 & 4

Alkyl halides: Introduction, Nomenclature, Physical properties, General methods for preparation, Chemical reactions, Analysis of alkyl halides

Ref. 2: 5.3 – 5.7, 5.24

Pages: 167 – 174, 211

Alcohols: Introduction, Nomenclature, Physical properties, General methods for preparation, Chemical reactions, Analysis of alcohols

Ref. 2: 6.1 – 6.5, 6.10, 6.11, 6.22

Pages: 211 – 218, 222 – 226, 243 – 244

Ethers: Introduction, Nomenclature, Physical properties, General methods for preparation, Chemical reactions, Analysis of ethers

Ref. 2: 6.16 – 6.21, 6.23

Pages: 237 – 242, 244 - 245

Aldehydes and ketones: Introduction, Nomenclature, Physical properties, General methods for preparation, Chemical reactions, Analysis of aldehydes and ketones

Ref. 2: 18.1 – 18.7, 18.20

Pages: 657 – 675, 697

Carboxylic acids: Introduction, Nomenclature, Physical properties, General methods for preparation, Chemical reactions, Analysis of carboxylic acids

Ref. 2: 19.1 – 19.4, 19.6, 19.9, 19.21

Pages: 713 – 722, 725 – 728, 744 - 745

Amines: Introduction, Nomenclature, Physical properties, General methods for preparation, Chemical reactions, Analysis of amines

Ref. 2: 22.1 – 22.5, 22.8, 23.1 – 23.3, 23.12, 23.19

Pages: 821 – 825, 828 – 830, 845 – 849, 866 – 869, 876 - 877

Phenols: Introduction, Nomenclature, Physical properties, General methods for preparation, Chemical reactions, Analysis of phenols

Ref. 2: 24.1 – 24.3, 24.7, 24.8, 24.16

Pages: 889 – 893, 898 – 902, 912

Aims and Objectives:-

The student is expected to know

1. Structure, nomenclature, preparation and reactions of organic compounds.
2. The characteristic reactions of each functional group which can be used to identify and distinguish that compound from other compounds.
3. Predict the conversion of one functional group into other functional group involving one or more number of steps.
4. Conversion of the given compound into other compound containing more or less number of carbon atoms.
5. Prediction of possible products when reactants are given. In case there are more than one possible products, identify the major and minor products.
6. Suggest the possible reagents to bring about the given conversion.

Chapter 5: Stereochemistry (10)

Concept of isomerism, types of isomers, representation of organic molecules (Projection formulae), conformational isomerism in alkanes (Ethane, propane and n-butane) with energy profile diagrams, Geometrical isomerism - Definition, conditions for geometrical isomers, physical and chemical properties, E/Z nomenclature of geometrical isomers, Optical isomers – Isomer number and tetrahedral carbon atom, chirality, optical isomerism with one asymmetric carbon atom, specific rotation, enantiomerism, R/S nomenclature

Ref. 1, 2, 3, 4, 11 and 12

Ref. 2: Relevant pages from Sec. 3.2 – 3.5, Sec.4.1 – 4.20, Sec. 8.6

Ref. 4: Relevant pages from Sec. 12.1 – 12.2 (Pages 318 – 321)

Ref. 11: Relevant pages from Sec. 1.1 – 1.3, 1.5 – 1.6, 1.8, 1.10 (Pages 1 – 51)

Aims and Objectives:-

The student is expected to know

1. Concept of isomerism, types of isomers and representation of organic molecules.
2. Conformational isomerism in alkanes with energy profile diagram.
3. Concept of geometrical isomerism with E/Z nomenclature.
4. Understanding of optical activity, isomer number, tetrahedral carbon atom, concept of chirality, enantiomerism, R/S nomenclature for single chiral centre.

Ref. 1, 2, 3 & 4

Chapter 6: Chemistry of p-block elements **(12)**

Position of elements in periodic table, electronic configuration of elements trends in properties like atomic size, ionization potential, electronegativity, electron affinity, reactivity, oxidation states, anamolous behaviuor of first member of each group.

Structure and properties of:

1. Borate
2. Halides of aluminum
3. Allotropes of carbon
4. Classification of silicates
5. Oxyacids of phosphorous and sulphur
6. Inter-halogen compounds

Ref. 6 – 359 to 633 (relevant pages)

A student know
i) To write electronic configuration of any element.
ii) To give reasons for anomolous behavior of first element of IIIA to VII A groups with other
elements in the same group.
iii) To know the exact position p-block elements in the long form of the periodic table.
iv) To know the allotropes of carbon.
v) Basic compounds of boron, aluminum, silicon
vi) Concept of oxyanions, different than mineral acids, oxyacids of phosphorous & sulphur
vii) Overlpping of atomic orbitals of halogens, interhalogen compounds

References

1. Organic Chemistry-Clayden, Oxford Uni. Press

2. Organic Chemistry-Morrison and Boyd, 6th Edn.
3. A guide book to Mechanism in Organic Chemistry-Peter Syke, 6th Edn.
4. Stereochemistry of Organic Compounds-Eliel Tata Mc Graw Hill 1989
5. Principles of Physical Chemistry by S.H. Marron & C.F. Pruton, 4th Edn.
6. Concise Inorganic Chemistry-J.D. Lee, 2nd Edition-Relevant pages.
7. Concept & model of Inorganic Chemistry-Douglas Mc Doniels, 3rd Edn.
8. New guide to Modern Valance Theory-G.I. Brown, 3rd Edn.
9. Inorganic Chemistry-James Hughey
10. General Chemistry - Raymand Chang

F.Y.B. Sc.

Chemistry Paper - III

Practical Course

1. Physical Chemistry : 7 experiments
2. Inorganic Chemistry: 7 experiments
3. Organic Chemistry : 7 experiments

Physical Chemistry (minimum 7 experiments)

1. A) Preparation of lyphophyllic and lypophobic sols, B) purification of prepared sols by hydrolysis
2. To study the role of emulsifying agents in stabilizing the emulsion of different oils
3. Sketch the polar plots of s and p orbitals.
4. Plot the graph of following functions using excel a) exponential function b) logarithmic function c) linear functions
5. To determine the gas constant R in different units by eudiometer method.
6. To determine relative viscosity of given organic liquids by viscometer. (four liquids)
7. Investigate the adsorption of acetic acid by activated charcoal and test the validity of Freundlich /Langmuir adsorption isotherm.
8. To determine ΔH and ΔS for the following chemical reactions

   i) $Zn(s) + CuSO_4\ (aq) \rightarrow Cu(s) + ZnSO_4\ (aq)$

   ii) $3Mg(s) + 2FeCl_3\ (aq) \rightarrow 2Fe(s) + 3MgCl_2\ (aq)$

Inorganic Chemistry (minimum 7 experiments)

A. Compulsory experiments

9. Determination of hardness of water from a given sample of water by EDTA method.
10. Analysis of alkali mixture by volumetric method.

B. Any Three Inorganic qualitative analyses without phosphate and borate removal.

11) Mixture-1 (water soluble)

12) Mixture-2 (water insoluble)

13) Mixture-3 (water insoluble)

C-Any one of the following

14) To standardize NaOH solution & hence find the strength of given HCl solution.

15)To standardize $KMnO_4$ soln. & hence find strength of the given solution

D Any One of the following:

16) Estimation of % purity of a given sample of sodium chloride.

17) Analysis of brass

Organic Chemistry (Minimum 7 experiments)

18. Techniques (**any two**) - To be carried out on micro-scale
    i. Thin layer chromatography
    ii. Crystallization with M.P. and % yield of purified compound
    iii. Distillation with B.P. and % yield of purified compound
    iv. Sublimation with M.P. and % yield of purified compound
19. Estimations (**any one**)
    i. To determine amount of acetic acid in commercial vinegar
    ii. To determine amount of aspirin in APC tablets
20. Organic qualitative analysis of single organic compound at least one belonging from each type (**any four**)

    Type, Preliminary tests, elements, functional group, physical constants

    a. Benzoic acid, Salicylic acid, Cinnamic acid, Phthalic acid, oxalic acid
    b. β-Naphthol, α-naphthol
    c. Aniline, N,N-Dimethyl aniline
    d. Napthalene, Thiourea, Urea, m-Dinitrobenzene, chloroform, ethyl methyl ketone, ethyl acetate, chlorobenzene

Pattern for F.Y.B.Sc. Practical Examination

Sr. No.	Experiment	Marks
1	Physical chemistry OR Inorganic Volumetric OR Organic Estimation	35
2	Inorganic Qualitative Analysis OR Organic Qualitative Analysis and Technique	35
3	Oral	10
4	Internal marks for Journal and Oral	20

Note:-

1. At the time of Practical examination in a batch 50 % students must be given Physical Experiments.
3. For Organic Qualitative Analysis 20 marks & for technique 15 marks.
4. For Volumetric Analysis students must prepare standard solutions.
5. External printed material or practical book/ text book is allowed during the practical examination.