2022

Kavayitri Bahinabai Chaudhari North Maharashtra University, Jalgaon

Syllabus

Class : F. Y. B. Sc.

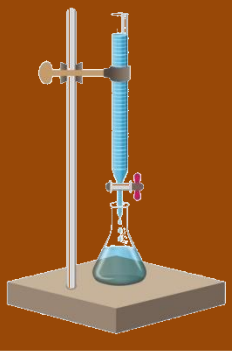
Subject : Chemistry

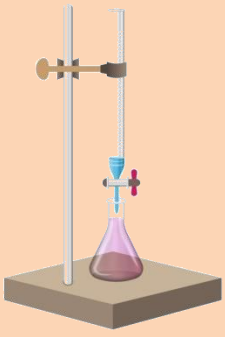
Choice Based Credit System (CBCS)

(With effect from June 2022)

Prepared By

Board of Studies in Chemistry,
Kavayitri Bahinabai Chaudhari North Maharashtra University, Jalgaon





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Revised Syllabus of F.Y.B.Sc. Chemistry

(With effect from June 2022)

Choice Based Credit System (CBCS) Pattern

In the Faculty meeting chaired by Hon. Dean of Science faculty, the revised syllabus for F.Y.B.Sc. (Chemistry) is accepted and finalized as per guidelines of Academic Council and with reference to the U.G.C. model curriculum. The course structure for F.Y.B.Sc. (Chemistry) is as given below.

Course (Paper code)	Paper	Semester	No. of lectures	Credits	Internal Marks	External Marks
CH-101	**Physical & Inorganic Chemistry (Core Course)**	**I**	**30**	**02**	**40**	**60**
CH-102	**Organic & Inorganic Chemistry (Core Course)**	**I**	**30**	**02**	**40**	**60**
CH-103	**Chemistry Practical**	**I**	**60**	**02**	**40**	**60**
CH-201	**Physical & Inorganic Chemistry (Core Course)**	**II**	**30**	**02**	**40**	**60**
CH-202	**Organic & Inorganic Chemistry (Core Course)**	**II**	**30**	**02**	**40**	**60**
CH-203	**Chemistry Practical**	**II**	**60**	**02**	**40**	**60**

Note:

1. Each lecture is of one hour duration.
2. Each theory paper has two lectures per week.
3. Each practical course has four lectures per week.

Chairman B.O.S. **Dean Science Faculty**

Kavayitri Bahinabai Chaudhari

North Maharashtra University, Jalgaon

Revised Syllabus of F.Y.B.Sc. Chemistry (w.e.f. June 2022)

Choice Based Credit System (CBCS) Pattern

Semester I

Paper- CH: 101 Physical and Inorganic Chemistry

Chapter 1: Atomic Structure (Part-I) (L: 06, M: 12)

a) Atomic Models: Thomson Model, Rutherford's Nuclear Model

b) Emission and Absorption Spectra: Line spectra and band spectra, line spectra of Hydrogen atom,

c) Bohr Model for Hydrogen atom, explanation of line spectra of hydrogen atom, Limitations & Reasons for failure of Bohr Model

d) Quantum Mechanical Model of atom: Dual behaviour of matter, Davisson–Germer experiment, Heisenberg's Uncertainty Principle, Orbitals and quantum numbers and their importance

Ref: 1, 2 (relevant pages)

Learning Outcome

Students will develop knowledge about:

i) Various theories and principles applied to reveal atomic structure.

ii) Nature of matter and experiments which confirmed it.

iii) Significance of quantum numbers.

Chapter 2: Mathematical Preparation in Chemistry (L: 06, M: 12)

a) Logarithm: Rules of Logarithm (without proof), Characteristic and Mantissa of Logarithm, Negative Logarithm, numerical based on applications of Logarithm in calculating pH with change of base of logarithm, antilogarithm.

b) Graphical representation of equations: Rules for drawing graph co-ordinates etc., Equation of straight line, slope and intercept, plotting the graph from the given experimental data and numericals.

c) Derivative: Significance, Rules of differentiation (without proof), Algebraic, Logarithmic and exponential functions and numerical.

d) Integration: Significance, rules of integration (without proof), Integration with limit, Algebraic, Logarithmic and exponential functions and numerical.

e) Numericals of each method related to Chemistry.

Ref: 3 (relevant pages)

Learning Outcome

Students will be able to:

i) Apply the rules of logarithm for solving numericals in chemistry

ii) Draw, calculate the slope of various graphs for chemistry experiments

iii) Calculate derivative and integration of some simple functions especially related to chemical problems

Chapter 3: The Gaseous State (L: 08, M: 16)

a) Molar gas constant R, its values in different units and its significance, the kinetic theory of ideal gases. Assumptions of kinetic theory of gases. Kinetic gas equation and its Significance (Derivation not expected), Deductions of Avogadro's principle, Graham's law, kinetic energy of translation.

b) Deviation of real gases from ideal behaviour. Reasons for deviation, compressibility factor, Van der Waal's equation, its applications. Andrew's isotherms of CO_2, relation between critical constants and Van der Waal's constants, liquification of Gases, Joule Thomson effect, related numerical

Ref. 1, 2 (Relevant pages)

Learning Outcome

Students will develop knowledge about,

i) The basics of kinetics theory and concepts therein.

ii) Factors causing the deviations from ideal behaviour of gases

iii) Compressibility, liquification and related critical constants of a system

Chapter: 4 Atomic structure (Part-II) (L: 05, M: 10)

a) Long form of periodic table, Periodic law, modern periodic law, electronic configuration, Aufbau principle, Hund's rule, Pauli's Exclusion principle, Principle of stability.

b) Classification of elements based on electronic configuration and energy levels

c) Shapes of s, p and d-orbitals.

Ref: 9, 10 (Relevant pages)

Learning outcomes

Students will be able:

i) To know about the structure of atom.

ii) To acquire the knowledge about the arrangement of elements in a periodic table

iii) To familiar with the classification of elements in periodic table.

iv) To know about the principle involved in arrangements of electrons in atoms.

v) To understand the shapes of different types of orbitals present in atoms.

Chapter: 5 Periodic properties (L:05, M:10)

Periodicity in the following properties right through the periodic table:

a) Atomic and ionic size: Definition and explanation of atomic radius, ionic radius, covalent radius and Van der Waals radius, Variation of atomic size along a period and a group.

b) Ionisation energy: Definition and explanation, factors affecting ionisation energy, Variation of ionisation energy along a period and a group. Applications of I. E. to chemical behavior of an element.

c) Electron affinity: Definition and explanation, factors affecting electron affinity, Variation of electron affinity along a period and a group.

d) Electronegativity: Definition and explanation, factors affecting electronegativity, Variation of electronegativity along a period and a group, Pauling's electronegativity scale, Mullikan's approach of electro negativity, electro negativity and percent ionic character.

e) Metallic character: Variation of metallic character along a period and a group.

Ref: 9, 11 (Relevant pages)

Learning outcomes

Students will be able:

i) To understand the periodic law and systematic study of elements.

ii) To find the factors affecting periodic properties.

iii) To understand periodic properties and their general trends in groups and periods. (Atomic size, Ionization energy, Electron affinity, Electro negativity, Metallic properties).

iv) To correlate these periodic properties with the chemical behavior of elements.

v) To understand the different methods used to determine electronegativity.

References:

1. Principles of Physical Chemistry, B. R. Puri, L. R. Sharma, M.S. Pathaniya
2. Essentials of Physical Chemistry, B. S. Bahl, G. D. Tuli, Arun Bahl (S. Chand & Co Ltd.)
3. Mathematical Preparation for Physical Chemistry, Farrington Daniels, Mc Graw- Hill Publication.
4. Barrow, G.M. Physical Chemistry Tata McGraw-Hill (2007)
5. Atkins' Physical Chemistry, 10th edition (2014), Oxford University Press
6. Thomas Engel, Philip Reid; Physical Chemistry, Pearson Education (2006)
7. J. N. Gurtu, A. Gurtu, Advanced Physical Chemistry, Pragati Edition
8. Principles of Physical Chemistry 4th edition Samuel Maron, Carl F. Prutton, Oxford & IBH Publishing.
9. Concise inorganic chemistry – J. D. Lee (5th edition).
10. Principles of Inorganic Chemistry – Puri, Sharma, Kalia.
11. Advanced Inorganic Chemistry (Vol I) (Satyaprakash, G. D. Tuli, S. K. Basu, R. D. Madan) (S. Chand and Co Ltd.) Page Nos. 364-376.
12. Inorganic Qualitative Analysis—A I Vogel
13. Practical chemistry (for B.Sc. I, II and III year students) – O P Pandey, D. N. Bajpai and S. Giri (S Chand and company Ltd)
14. Theoretical Principles of Inorganic Chemistry – G S Manku.
15. Analytical Chemistry – G. D. Christian (6th Edition).
16. A new guide to Modern Valency Theory –G. I. Brown.

Paper- CH: 102 Organic and Inorganic Chemistry

Chapter 1: Basic principles of organic chemistry (L:12, M:24)

a) Introduction, general properties of organic compounds, applications of organic compounds in everyday life.

b) Covalent bond, double and triple bonds, structural formulae of organic compounds

c) Structure of benzene, stability of benzene (heat of hydrogenation), Huckel's rule of aromaticity, derivatives of benzene and their nomenclature (mono & disubstituted benzene only)

d) Structural effects: Inductive effect, resonance, hyperconjugation, steric effect, electromeric effect and their effect on the strength of acids and bases.

e) Fundamentals of organic reaction mechanism: Fission of covalent bond: homolytic and heterolytic fission, reactive intermediates: carbocations, carbanions and carbon free radicals, types of reagents: electrophiles and nucleophiles, types of organic reactions: addition, elimination, substitution and rearrangement reactions.

f) Isomerism, types of isomerism, structural isomerism

g) Purification of organic compounds: recrystallization (by water and alcohol), distillation and sublimation

h) Solvents, properties of solvents, types of solvents i) protic and aprotic ii) polar and nonpolar

Ref. 1,2,3,4,5 (relevant pages)

Learning outcomes

Students will be able to understand:

1. The properties of organic compounds.
2. Different types of bonds and structures of organic compounds.
3. Different types of structural effects and their effect on the strength of acids and bases.
4. Fundamentals of organic reaction mechanism, structural isomerism, methods of purification of organic compounds.
5. Different types of solvents used in organic reactions.

Chapter 2: Hydrocarbons (L:08, M:16)

a) Alkanes: Introduction to alkanes and cycloalkanes, SP^3 hybridization in ethane molecule, nomenclature (common and IUPAC system), isomerism in alkanes

b) Preparation of alkanes: by Wurtz reaction, by hydrogenation of alkenes. Reactions of alkanes: halogenation, nitration, combustion.

c) Alkenes: Introduction, SP^2 hybridization in ethylene molecule, nomenclature (common and IUPAC system), geometrical isomerism in alkenes

d) Preparation of alkenes: by dehydration of alcohols, dehydrohalogenation of alkyl halides, dehalogenation of vicinal dihalides and partial reduction of alkynes by Lindlar catalyst. Reactions of alkenes: Addition of halogen, hydrogen halide, Sulphuric acid and hydration.

e) Alkynes: Introduction, SP hybridization in acetylene molecule, nomenclature (common and IUPAC system), acidity of acetylene and terminal alkynes.

f) Preparation of alkynes: by Double Dehydrohalogenation of vicinal and geminal dihalides, by alkylation of acetylene.

g) Reactions: Addition of halogens, hydrogen halides, hydration, hydrogenation, ozonolysis.

Ref. 1,2,3,4 (relevant pages)

Learning outcomes

Students will be able to understand:

1. SP^3, SP^2 and SP hybridizations.
2. Nomenclature of alkanes, alkenes and alkynes.
3. Different methods of preparation of alkanes, alkenes and alkynes.
4. Different reactions of alkanes, alkenes and alkynes.

Chapter: 3 Hybridization and shapes of covalent molecules (L: 10, M: 20)

a) Hybridization: Definition, need of hybridization, steps involved in hybridization, characteristics of hybridization. Types of hybridizations involving s, p and d orbitals: SP^3d, SP^3d^2, SP^3d^3 and dSP^2 hybridizations.

b) Applications of hybridization concept: geometries of molecules like PCl_5, SF_6, IF_7 and $[Ni(CN)_4]^{2-}$ ions.

c) Valence Shell Electron Pair Repulsion (VSEPR) Theory: assumptions, need of theory, Applications of the theory to explain geometry of irregular molecules like $SnCl_2$, NH_3, H_2O, ClF_3, SF_4, BrF_5, ICl_2^-, ICl_4^-. Limitations of VSEPR theory.

Ref: 8, 9, 10 (relevant pages)

Learning outcomes

Students will be able to understand:

1. Concept of hybridization, steps involved in hybridization, characteristics and types of hybridization.
2. Applications of hybridization concept to understand geometries of different molecules.
3. Valence Shell Electron Pair Repulsion (VSEPR) Theory and its applications to explain geometry of irregular molecules.
4. Limitations of VSEPR theory.

Reference Books

1) Organic chemistry - Francis A Carey (6th Edition)
2) Organic chemistry - Morrison and Boyd (6th Edition)
3) Organic chemistry - Stanley H pine (5th Edition)
4) A Text book of Organic chemistry- Arun Bahl and B S Bahl, S Chand publication.
5) Guide book to mechanism in organic chemistry -Peter Sykes (6th Edition)
6) Undergraduate organic chemistry volume I – Jagdamba Singh and LDS Yadav
7) Organic Chemistry (Volume 1) – I L Finar
8) Concise inorganic chemistry – J. D. Lee (5th edition).
9) Principles of Inorganic Chemistry – Puri, Sharma, Kalia.
10) Advanced Inorganic Chemistry (Vol I) (Satyaprakash, G. D. Tuli, S. K. Basu, R. D. Madan) (S. Chand and Co Ltd.) Page Nos. 364-376.
11) Inorganic Qualitative Analysis—A I Vogel
12) Practical chemistry (for B.Sc. I, II and III year students) – O P Pandey, D. N. Bajpai and S. Giri (S Chand and company Ltd)
13) Theoretical Principles of Inorganic Chemistry – G S Manku.
14) Analytical Chemistry – G. D. Christian (6th Edition).
15) A new guide to Modern Valency Theory –G. I. Brown.

Semester II

Paper- CH: 201 Physical and Inorganic Chemistry

Chapter 1: Liquid State **(L: 06, M: 12)**

a) Introduction, Intermolecular forces in liquid state and their types.

b) Surface tension of liquid, units of surface tension, factors affecting surface tension, Unit of Surface tension, determination of surface tension of liquids by single capillary rise method and Drop formation method.

c) Viscosity of liquid, units of viscosity, measurement of viscosity of liquid by Ostwald's method, related numerical.

Ref. 2, 3 (Relevant pages)

Learning outcomes

Students will be able:

i) To gain knowledge about origin of surface tension.

ii) To determine surface tension.

iii) To get idea regarding viscosity.

iv) To determine viscosity.

Chapter 2: Chemical Equilibrium **(L: 06, M: 12)**

a) Introduction, reversible reaction, characteristics of chemical equilibrium, law of mass action, equilibrium constant: equilibrium law, equilibrium constant in terms of partial pressures, calculations involving Kp, liquid systems, heterogeneous equilibria.

b) Le Chatelier's principle, effect of change in concentration, pressure, temperature, conditions for maximum yield in industrial processes, synthesis of ammonia (Haber process), related numerical.

Ref. 2 (Relevant pages)

Learning outcomes

i) Students will be able to understand equilibrium.

ii) Students will be able to understand different factors affecting equilibrium.

iii) Students gain knowledge about Le Chatelier's principle.

Chapter 3: Second and Third Law of Thermodynamics **(L: 08, M: 16)**

a) Introduction, Limitations of first law of thermodynamics, spontaneous and non-spontaneous process with examples, Statements of second law of thermodynamics,

b) Entropy, Units of entropy, Physical Significance of entropy, entropy changes in isolated systems, entropy changes for systems only, entropy of mixing of gases, entropy changes in ideal gases and physical transformation.

c) Statement of third law of thermodynamics, list its applications, Numerical.

Ref.: 1 and 2

Learning outcomes

h) Students will be able to apply thermodynamic principles to physical and chemical process.

ii) Students will be able to understand spontaneity and non-spontaneity.

iii) Calculations and significance of entropy.

iv) Third law of thermodynamics and its applications.

Chapter: 4 Principles involved in Inorganic Qualitative Analysis (L: 06, M: 12)

a) Difference between crystalline and amorphous substance, meaning of dry and wet tests, precipitate, Group reagents.

b) Ionic product, Solubility product, Common ion effect.

c) Use of Cobalt nitrate, Sodium carbonate, Hydrogen sulphide and Ammonium chloride in qualitative analysis.

Ref: 10, 11 (Relevant pages)

Learning outcomes

Students will be able:

i) To familiar with the Inorganic Qualitative Analysis.

ii) To understand the basic principles behind the group precipitation of basic radicals like solubility product and common ion effect.

iii) To understand the role of some compounds in qualitative analysis viz. Use of Cobalt nitrate, Sodium carbonate, Hydrogen sulphide and Ammonium chloride in detection of basic radicals.

iv) To focus on systematic separation and detection of ions in aqueous solutions.

Chapter: 5 Ionic equilibria (L: 04, M: 08)

a) Strong and weak acids and bases, degree of dissociation, dissociation constants of acids and bases.

b) p^H and p^{OH}, numerical based on p^H and p^{OH} only, ionic product of water, Henderson-Hassalbalch's equation of indicator.

c) Buffer solutions: Definition, types, buffer action, buffer capacity, applications of buffer solutions.

Ref: 8, 11, 12, 13 (Relevant pages)

Learning outcomes

Students will be able:

i) To understand the criteria of classification of acids and bases.

ii) To identify and write different types of equilibria of an electrolyte in solutions.

iii) To calculate the p^H and p^{OH} of different electrolytes.

iv) To know about the buffer solution and its applications.

References

1. Principles of Physical Chemistry, S. H. Maron and C. F. Prutton (4th edition).
2. Essentials of Physical Chemistry, B. S. Bahl, G. D. Tuli, Arun Bahl (S. Chand and Co Ltd.) (25th edition).
3. Elements of Physical Chemistry, S. Glasstone and D. Lewis (The Macmillan Press Ltd. (2nd edition).
4. Essentials of Physical Chemistry, B. S. Bahl, G. D. Tuli, Arun Bahl (S. Chand and Co Ltd.)
5. Physical Chemistry Barrow, G.M. Tata McGraw-Hill (2007)
6. Atkins' Physical Chemistry, 10th edition (2014), Oxford University Press
7. Concise inorganic chemistry – J. D. Lee (5th edition).
8. Principles of Inorganic Chemistry – Puri, Sharma, Kalia.
9. Advanced Inorganic Chemistry (Vol I) (Satyaprakash, G. D. Tuli, S. K. Basu, R. D. Madan) (S. Chand and Co Ltd.) Page Nos. 364-376.
10. Inorganic Qualitative Analysis—A I Vogel
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12. Theoretical Principles of Inorganic Chemistry – G S Manku.
13. Analytical Chemistry – G. D. Christian (6th Edition).
14. A new guide to Modern Valency Theory –G. I. Brown.

Paper- CH: 202 Organic and inorganic chemistry

Chapter 1: Haloalkanes and haloarenes (L:06, M:12)

a) Haloalkanes: Introduction, classification and nomenclature of haloalkanes (common and IUPAC system)

b) Mono halogen derivatives: Classification, methods of preparation: from alcohols (using HX, PX_3, PX_5, $SOCl_2$). Reactions: with aqueous alkali, sodium alkoxide, alc. KCN, silver salt of acid, alc. ammonia, NaSH/ KSH, dehydrohalogenation, formation of Grignard's reagent.

c) Di halogen derivatives: preparation of vicinal and geminal dihalides, reactions: hydrolysis with aq. NaOH.

d) Haloarenes: Introduction, nomenclature, reactions of haloarenes: nucleophilic substitution reactions with $NaNH_2$/ KNH_2, NaOH, NH_3, CuCN, Ullman reaction.

Ref. 1,2,3,4 (relevant pages)

Learning outcomes

Students will be able to understand:

1. Haloalkanes, their classification and nomenclature.
2. Different methods of preparation of mono halogen derivatives.
3. Different reactions of mono halogen derivatives.
4. Different methods of preparation and reactions of di halogen derivatives.
5. Different methods of preparation and reactions of haloarenes.

Chapter 2: Alcohols, phenols and ethers (L:06, M:12)

a) Alcohols: Introduction, classification, nomenclature (common and IUPAC system), methods of preparation of monohydric alcohols: from Grignard's reagent (using aldehydes and Ketones), by reduction of aldehydes and ketones, by hydroboration, by oxymercuration-demercuration. Preparation of dihydric alcohols by hydroxylation of alkenes.

b) Physical properties of alcohols. Reactions of alcohols: reaction with active metals, dehydration, oxidation and ester formation.

c) Phenols: Introduction, nomenclature, acidity of phenols, Preparation of phenol from benzene sulphonic acid, benzene diazonium chloride and from chlorobenzene.

d) Reactions of phenols: ester formation (acylation), formation of aryl ethers, Kolbe reaction, catalytic hydrogenation.

e) Ethers: Introduction, classification, nomenclature (common and IUPAC system), methods of preparation: by Williamson's synthesis, by dehydration of alcohols and from diazomethane. Reactions of ethers: reaction with hot and cold HI, hydrolysis with dil. H_2SO_4. Crown ethers (Introduction only)

Ref. 1,2,3,4 (relevant pages)

Learning outcomes

Students will be able to understand:

1. Alcohols, their classification and nomenclature.
2. Different methods of preparation and reactions of alcohols.
3. Different methods of preparation and reactions of phenols.
5. Different methods of preparation and reactions of ethers.

Chapter 3: Aldehydes and ketones (L:08, M:16)

a) Introduction, structure of carbonyl group, nomenclature of aldehydes and ketones (common and IUPAC system)

b) Aldehydes: Preparation of aldehydes: by reduction of acid chlorides, from Grignard's reagent and HCN, from terminal geminal dihalides and from calcium salt of acids. Preparation of benzaldehyde: by Gattermann Kotch reaction, by oxidation of toluene, by side chain chlorination of toluene.

c) Ketones: Preparation from Grignard's reagent and R-CN, from nonterminal geminal dihalides, from calcium salt of acids. Preparation of acetophenone: by oxidation of ethyl benzene, by F C acylation.

d) Reactions of aldehydes & Ketones: Reducing properties of aldehydes: reaction with Tollen's reagent and Fehling's solution, Clemmenson reduction, Wolff Kishner reduction, Aldol condensation, Cannizzaro reaction, addition of HCN, $NaHSO_3$, addition of derivatives of ammonia (hydroxyl amine, phenyl hydrazine, 2,4 DNP, semicarbazide), hydration, addition of alcohols, benzoin condensation of benzaldehyde.

Ref. 1,2,3,4 (relevant pages)

Learning outcomes

Students will be able to understand:

1. Carbonyl compounds like aldehydes & Ketones, their classification and

nomenclature.

2. Different methods of preparation and reactions of aliphatic and aromatic aldehydes.
3. Different methods of preparation and reactions of aliphatic and aromatic ketones.

Chapter: 4 Chemical bonding and structure (L: 04, M: 08)

a) Attainment of stable configuration, Types of bonds-
   1. Ionic bond-NaCl, $CaCl_2$
   2. Covalent bond (Lewis concept)- H_2, Cl_2, HF, NH_3, H_2O, O_2 and N_2, molecules.
   3. Coordinate bond- NH_4^+, H_3O^+
   4. Metallic bond.

b) Types of overlaps: S-S, S-P and P-P overlaps with examples of H_2, HF, F_2, O_2, and N_2 molecules.

c) Theories of bonding: Valence Bond Theory, Heitler-London theory and Pauling-Slater theory.

Ref: 8, 10, 15 (Relevant pages)

Learning outcomes

Students will be able:

i) To understand different types of bonds.

ii)To understand different types of overlaps

iii)To understand different theories of chemical bonding

Chapter: 5 Metals and Metallurgy (L: 06, M: 12)

Occurrence of metals, various steps involved in metallurgical processes, concentration of ore, Hand picking, gravity separation, Magnetic separation, froth floatation, calcinations, roasting, reduction to free metals, Flux, Types of fluxes, Slag, electrometallurgy, hydrometallurgy, refining of metals.

Ref: 9, 13 (Relevant pages)

Learning outcomes

Students will be able:

i)To understand the importance of metallurgy in industries.

ii)To know the various steps involved in metallurgical processes.

iii)To understand the basic principles involved in separation, extraction and refining techniques of metals.

Reference Books

1) Organic chemistry - Francis A Carey (6th Edition)
2) Organic chemistry - Morrison and Boyd (6th Edition)
3) Organic chemistry - Stanley H pine (5th Edition)
4) A Text book of Organic chemistry- Arun Bahl and B S Bahl, S Chand publication.
5) Guide book to mechanism in organic chemistry -Peter Sykes (6th Edition)
6) Undergraduate organic chemistry volume I – Jagdamba Singh and LDS Yadav
7) Organic Chemistry (Volume 1) – I L Finar
8) Concise inorganic chemistry – J. D. Lee (5th edition).
9) Principles of Inorganic Chemistry – Puri, Sharma, Kalia.
10) Advanced Inorganic Chemistry (Vol I) (Satyaprakash, G. D. Tuli, S. K. Basu, R. D. Madan) (S. Chand and Co Ltd.) Page Nos. 364-376.
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13) Theoretical Principles of Inorganic Chemistry – G S Manku.
14) Analytical Chemistry – G. D. Christian (6th Edition).
15) A new guide to Modern Valency Theory –G. I. Brown.

CH:103 Chemistry Practical (Semester I)

A) Physical Chemistry Experiments (Any 2)

1. Determination of integral enthalpy of solution of salts (KNO_3, NH_4Cl)
2. Measurement of pH of different solutions like aerated drinks, fruit juices, shampoos and soaps (use dilute solutions of soaps and shampoos to prevent damage to the glass electrode) using pH-meter.
3. Determination of dissociation constant of weak monobasic acid (CH_3COOH) by conductance measurement.
4. Determination of relative viscosity of liquid A and B by viscometer.
5. Determination of percentage composition (v/v) of given mixture of ethyl alcohol and water by viscometer.

B) Analytical Chemistry Experiments (Any 3)

1. Preparation of std. 0.1N oxalic acid solution and standardization of NaOH solution.
2. Preparation of std. 0.1N $K_2Cr_2O_7$ solution and standardization of ferrous ammonium sulphate solution.
3. Preparation of std. 0.1N NaCl solution and standardization of $AgNO_3$ solution.
4. Preparation of std. 0.1N $ZnSO_4$ solution and standardization of EDTA solution.
5. Determination of loss per gram and percentage purity of Zinc Carbonate gravimetrically.

(Instruction: Prepare standard solutions preferably by using 50 ml volumetric flask)

C) Organic Qualitative Analysis (Any 5 compounds)

1) Type determination
2) Preliminary tests
3) Physical constant
4) Functional group tests

(Structural formula not expected)

CH: 203 Chemistry Practicals (Semester II)

A) Physical Chemistry Experiments (Any 3)

1. Determination of surface tension of given liquid by drop number method using stalagnometer.
2. Determination of surface tension of given liquid by drop weight method using stalagnometer.
3. Determination of heat of solution of KNO_3 / NH_4Cl by water equivalent method.
4. Determination of normality and strength in g/l of acid (HCl or CH_3COOH) conductometrically.
5. Determination of Solubility of Sparingly soluble salt by conductance measurement.
6. To standardize commercial sample of HCl using Borax and to write material safety data of the chemicals involved.

B) Analytical Chemistry Experiments (Any 2)

1. Preparation of standard 0.1N Na_2CO_3 solution and standardization of HCl solution.
2. Preparation of 0.1 N oxalic acid solution and standardization of $KMnO_4$ solution.
3. Preparation of 0.1 N $Na_2S_2O_3$ solution and estimation of Cu (II) ions iodometrically.
4. Determination of total hardness of water.

(Instruction: Prepare standard solutions preferably by using 50 ml volumetric flask)

C) Inorganic Qualitative Analysis (Any 5 compounds)

Analysis of inorganic compound containing one cation and anion

External Examination Pattern

Chemistry Practical Semester I/ II (CH-103/203)

Time: 3 Hrs.	**Marks 60**
Q. 1. Physical Chemistry / Analytical Chemistry experiment Marks	40
OR	
Inorganic/ Organic Qualitative analysis	
Q. 2. Oral Marks	10
Q. 3. Journal Marks	10
	Total: 60 Marks

Internal Examination Pattern

Chemistry Practical Semester I/ II (CH-103/203)

Time: 3 Hrs.	**Marks 40**
Q. 1. Physical Chemistry/ Analytical Chemistry experiment Marks	30
OR	
Inorganic/ Organic Qualitative analysis	
Q. 2. Oral Marks	05
Q. 3. Attendance and Behavior Marks	05
	Total: 40 Marks

Note: Distribution of Experiments – One fourth of the total students in a batch will be given physical chemistry experiment, one fourth will be given an analytical chemistry experiment and one half of the students will be given an Inorganic / Organic qualitative analysis.

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