(Applicable to the batch of students admitted in the academic year 2025-26 onwards)

B.Sc., Chemistry (CBCS) FACULTY OF SCIENCE, SU

B.Sc. (CHEMISTRY)
Syllabus (CBCS)
(w.e.f. 2025-2026)

FACULTY OF SCIENCE
SATAVAHANA UNIVERSITY
KARIMNAGAR – 505002

2025

TELANGANA COUNCIL OF HIGHER EDUCATION, GOVT. OF TELANGANA
B.Sc. CBCS Common Core Syllabi for all Universities in Telangana
PROPOSED SCHEME FOR CHOICE BASED CREDIT SYSTEM IN
B.Sc. CHEMISTRY
(Effective from the academic year 2025 – 2026 onwards)

FIRST YEAR-SEMESTER I				
CODE	**COURSE TITLE**	**COURSE TYPE**	**HPW**	**CREDITS**
BS 101	**Major – 1: Chemistry – I** **Laboratory Course – I** **(Quantitative Analysis – Titrations)**	DSC-1A	4T+2P = 6	4+1 = 5
BS 102	Major - 2	DSC-2A	4T+2P = 6	4+1 = 5
BS 103	Minor	DSC-3A	4T+2P = 6	4+1 = 5
BS 104	English	AEC-1A	5	5
BS 105	Second Language	AEC-2A	5	5
	TOTAL CREDITS		**28**	**25**
FIRST YEAR-SEMESTER II				
BS 201	**Major – 1: Chemistry – II** **Laboratory Course - II** **(Qualitative Analysis - Semi Micro Analysis of Mixtures)**	DSC-1B	4T+2P = 6	4+1 = 5
BS 202	Major - 2	DSC-2B	4T+2P = 6	4+1 = 5
BS 203	Minor	DSC-3B	4T+2P = 6	4+1 = 5
BS 204	English	AEC-1B	5	5
BS 205	Second Language	AEC-2B	5	5
	TOTAL CREDITS		**28**	**25**
SECOND YEAR-SEMESTER III				
CODE	**COURSE TITLE**	**COURSE TYPE**	**HPW**	**CREDITS**
BS 301	**Major – 1: Chemistry – III** **Laboratory Course - III** **(Synthesis of Organic compounds)**	DSC-1C	4T+2P = 6	4+1 = 5
BS 302	Major - 2	DSC-2C	4T+2P = 6	4+1 = 5
BS 303	Minor	DSC-3C	4T+2P = 6	4+1 = 5
BS 304	English	AEC-1C	5	5
BS 305	Second Language	AEC-2C	5	5
	TOTAL CREDITS		**28**	**25**
SECOND YEAR-SEMESTER IV				
BS 401	**Major – 1: Chemistry – IV** **Laboratory Course - IV** **(Qualitative Analysis of Organic Compounds)**	DSC-1D	4T+2P = 6	4+1 = 5
BS 402	Major - 2	DSC-2D	4T+2P = 6	4+1 = 5
BS 403	Minor	DSC-3D	4T+2P = 6	4+1 = 5
BS 404	English	AEC-1D	5	5
BS 405	Second Language	AEC-2D	5	5
	TOTAL CREDITS		**28**	**25**

THIRD YEAR-SEMESTER V				
CODE	**COURSE TITLE**	**COURSE TYPE**	**HPW**	**CREDITS**
BS 501	**Major – 1: Chemistry – V A/B** **A. Spectroscopy and Chromatography** **(Or)** **B. Metallurgy, Dyes, Batteries and Nanomaterials** **Laboratory Course – V** **(Experiments in Physical Chemistry)**	DSC-1E	4T+2P = 6	4+1 = 5
BS 502	Major - 2	DSC-2E	4T+2P = 6	4+1 = 5
BS 503	**MDC: Foundations of Chemistry – Concepts and Applications**	MDC-1	4	4
BS 504	Skill Enhancement Course – 1: **Rules in Chemistry Laboratory and Lab Reagents**	SEC-1	2	2
BS 505	Skill Enhancement Course – 2: **Effects of pollution & control of water Pollution, Drinking Water Treatment and Soil Analysis**	SEC-2	2	2
BS 506	Value Added Course - 1	VAC-1	3	3
	TOTAL CREDITS		**23**	**21**
THIRD YEAR-SEMESTER VI				
BS 601	**Major – 1: Chemistry – VI A/B** **A. Medicinal Chemistry** **(Or)** **B. Agricultural and Fuel Chemistry** **Laboratory Course - VI** **(Experiments in Physical Chemistry)**	DSC-1F	4T+2P = 6	4+1 = 5
BS 602	Major – 2 (A/B)	DSC-2F	4T+2P = 6	4+1 = 5
BS 603	Skill Enhancement Course – 3: **Materials and their Applications**	SEC-3	2	2
BS 604	Skill Enhancement Course – 4: **Chemistry of Cosmetics and Food Processing**	SEC-4	2	2
BS 605	Value Added Course - 2	VAC-2	3	3
BS 606	Internship/ Project Work		4	4
	TOTAL CREDITS		**23**	**21**
	GRAND TOTAL			**142**

Credits under Non-CGPA
(Community Engagement & Service)

1.	NSS/NCC/Sports/Extracurricular	Up to 6 Credits (2 in each year)
2.	IKS	Up to 4 (2 in each, after I & II years)

Major – 1	30
Major – 2	30
Minor	20
AEC (Ability Enhancement Course) – English	20
Second Language	20
MDC (Multi-Disciplinary Course)	4
SEC (Skill Enhancement Course)	8
VAC (Value Added Course)	6
Project	4
Total	**142**

B.Sc. I YEAR CHEMISTRY
SEMESTER WISE SYLLABUS
SEMESTER I
Paper – I
Chemistry – I

Unit-I (Inorganic Chemistry) **15h (1 h/week)**

S1-I-1: Chemistry of P-Block Elements **15h**

Structure and bonding in diborane (B_2H_6), Boron nitrogen compounds ($B_3N_3H_6$ and BN), Lewis acid nature of BX_3.

Carbides- Classification -ionic, covalent, interstitial-Structures and reactivity. Industrial applications. Silicones-Classification-straight chain, cyclic and cross-linked and applications.

Nitrides-Classification -ionic, covalent and interstitial- Reactivity – hydrolysis.

Oxides and Oxyacids: Definition and Types of oxides (a) Normal- acidic, basic amphoteric and neutral (b) Mixed oxide (c) sub oxide (d) peroxide (e) superoxide. Structure of oxides and oxyacids of B, C, N, P, S and Cl - reactivity, thermal stability, hydrolysis.

Interhalogens- Classification- general preparation- structures of AB, AB_3, AB_5 and AB_7 type and reactivity.

Poly halide: Definition and structure of ICl_2^-, ICl_4^- and I_3^-.

Pseudohalogens: Comparison with halogens.

Structure, bonding and reactivity of Xenon Compounds-Oxides, Halides and Oxy-halides.

Unit - II (Organic Chemistry) **15h (1 h/week)**

S1-O-1: Structural Theory in Organic Chemistry **5h**

Bond polarization: Factors influencing the polarization of covalent bonds, electro negativity – inductive effect. Application of inductive effect (a) Basicity of amines (b) Acidity of carboxylic acids (c) Stability of carbonium ions. Resonance - Mesomeric effect, application to (a) acidity of phenol. (b) acidity of carboxylic acids and basicity of anilines. Stability of carbo cations, carbanions and free radicals. Hyper conjugation and its application to stability of carbonium ions, free radicals and alkenes.

S1-O-2: Acyclic Hydrocarbons **5h**

Alkanes– Methods of preparation: Preparation of Alkanes from Grignard reagent. Chemical reactivity- inert nature, free radical substitution, Halogenation example.

Alkenes - Preparation of alkenes (with mechanism) (a) by dehydration of alcohols (b) dehydrohalogenation of alkyl halides (c) by dehalogenation of 1,2 dihalides, Zaitsev's rule. **Properties:** Anti-addition of halogen and its mechanism. Addition of HX, Markovnikov's rule, addition of H_2O, HOX with mechanism and addition of HBr in the presence of peroxide (anti–Markovnikov's addition). Oxidation (cis–additions) hydroxylation by $KMnO_4$, OsO_4, anti-addition-peracids (via epoxidation), ozonolysis – location of double bond.

Alkynes– Preparation by dehydrohalogenation of vicinal dihalides, dehalogenation of tetrahalides. **Physical Properties:** Chemical reactivity – electrophilic addition of X_2, HX, H_2O (tautomerism), Oxidation (formation of enediol) and reduction (catalytic hydrogenation).

S1-O-3: Aromatic Hydrocarbons **5h**

Introduction to aromaticity: Huckel's rule – Benzene, Naphthalene and Anthracene. Reactions - General mechanism of electrophilic substitution, mechanism of nitration, sulphonation and halogenation, Friedel Crafts alkylation and acylation. Orientation of aromatic substitution - Definition of ortho, para and meta directing groups. Ring activating and deactivating groups with examples. Orientation – (i) activating groups: Amino, methoxy and alkyl groups. (ii) Deactivating groups - nitro, nitrile, carbonyl, carboxylic acid, sulphonic acid and halo groups.

Unit – III (Physical Chemistry) **15h (1h/week)**

S1-P-1: Elementary quantum mechanics **3h**

Limitations of classical mechanics and Origin of quantum mechanics-Black body radiation, Rayleigh Jeans law; Planck's radiation law, photoelectric effect, Compton effect, de Broglie's hypothesis. Heisenberg's uncertainty principle. Schrödinger wave equation (derivation not required) – significance of ψ and ψ^2.

S1-P-2: Chemical Kinetics **8h**

Introduction to chemical kinetics, rate of reaction, rate laws and rate constant. Molecularity and Order of a reaction. Factors influencing the reaction rates. First order reaction, derivation of equation for rate constant. Characteristics of first order reaction. Units for rate constant. Half- life period, graph of first order reaction, Example - Decomposition of H_2O_2. Problems. Pseudo first order reaction, Hydrolysis of methyl acetate, inversion of cane sugar, problems. Second order reaction, derivation of expression for second order rate constant, example-Saponification of ester. Characteristics of second order reaction, units for rate constants, half- life period and second order plots. Problems. Methods for determining the order of a reaction. Arrhenius equation – activation energy -problems.

S1-P-3: Photochemistry **4h**

Introduction to photochemistry – differences between dark and photo reactions. Laws of photochemistry; Quantum Yield – problems; Examples of photo chemical reactions with different quantum yields. Photo chemical combinations of H_2–Cl_2 and H_2–Br_2 reactions. Abnormal quantum yield – high and low-examples with reasons. Singlet and triplet states. Jablonski diagram – non-radiative processes – Internal conversion and Intersystem crossing; radiative processes- Fluorescence and phosphorescence.

Unit - IV (General Chemistry) **15h (1h/week)**

S1-G-1. General Principles of Inorganic quantitative Analysis: **5h**

Volumetric Analysis: Introduction, standard solutions, indicators, end point, titration curves, Types of titrations: i) neutralization titration- principle, theory of acid base indicators, titration curves and selection of indicators- strong acid - strong base, strong acid –weak base, weak acid- strong base and weak acid –weak base. Theory of redox titrations – internal ($KMnO_4$) and external indicators – use of diphenylamine and ferroin indicators. Theory of complexometric titrations – use of EBT, Murexide and Fast sulphone black indicators. Role of pH in complexometric titrations. Precipitation titrations – theory of adsorption indicators.

S1-G-2. Isomerism **5h**

Isomerism: Definition of isomers. Classification of isomers: Constitutional and Stereoisomers - definition and examples. Constitutional isomers: chain, functional and positional isomers. Stereoisomers: enantiomers and diastereomers – definitions and examples. Representation of stereoisomers – Wedge, Fischer, Sawhorse, Newmann projection formulae.

Conformational analysis: Classification of stereoisomers based on energy. Definition and examples Conformational and configurational isomers. Conformational analysis of ethane, n- butane, 1,2-dichloroethane, 2-chloroethanol. Cis-trans isomerism: E-Z-Nomenclature.

S1-G-3 Colloids & Surface Chemistry **5h**

Colloids: Definition of colloids-classification of colloids-examples. Solid in liquid (sol)-Preparation, kinetic and electrical properties, stability and protection of colloids - Hardy-Schulze rule and Gold number. Liquid in liquid (emulsion)-types of emulsions and emulsifier. Liquid in solid (gel)-types and properties. Applications of colloids.

Adsorption: Types of adsorptions; Factors influencing adsorption; Freundlich adsorption isotherm and Langmuir adsorption isotherm. Applications.

References

General reference: B.Sc I Year Chemistry : Semester I, Telugu Academy publication, Hyd.

Unit- I

1. Puri, B. R., Sharma, L. R., & Kalia, M. S. (1996). Principles of inorganic chemistry. Vishal Publications.
2. Lee, J. D. (1981). Concise inorganic chemistry (3rd ed.). Oxford University Press.
3. Cotton, F. A., Wilkinson, G., & Gaus, P. L. (2001). Basic inorganic chemistry (3rd ed.). Wiley.
4. Huheey, J. E., Keiter, E. A., & Keiter, R. L. (1993). Inorganic chemistry: Principles of structure and reactivity (4th ed.). Harper Collins College Publishers.
5. Greenwood, N. N., & Earnshaw, A. (1989). Chemistry of the elements. Pergamon Press.
6. Shriver, D. F., & Atkins, P. W. (1999). Inorganic chemistry (3rd ed.). Oxford University Press.
7. Gopalan, R. (2009). Textbook of inorganic chemistry. Universities Press.

Unit- II

1. Morrison, R. T., & Boyd, R. N. (2011). Organic chemistry. Pearson Education (Prentice Hall).
2. Solomons, T. W. G., & Fryhle, C. B. (2016). Organic chemistry. Wiley (John Wiley & Sons).
3. Bruice, P. Y. (2017). Organic chemistry. Pearson Education.
4. Wade, L. G., Jr. (2013). Organic chemistry. Pearson Education.
5. Jones, M., Jr. (2010). Organic chemistry. W. W. Norton & Company.
6. McMurry, J. (2015). Organic chemistry. Cengage Learning (Brooks/Cole).
7. Soni, P. L., & Soni, H. M. (2012). Organic chemistry. Sultan Chand & Sons.
8. Ghosh, S. K. (2009). General organic chemistry. Bharati Bhawan Publishers.
9. Pillai, C. N. (2008). Organic chemistry. Universities Press (India) Pvt. Ltd.

Unit III

1. Puri, B. R., Sharma, L. R., & Pathania, M. S. (2013). Principles of physical chemistry (46th ed.). Vishal Publishing Company.
2. Raj, G. (2009). Advanced physical chemistry (35th ed.). Goel Publishing House.
3. Lewis, G., & Glasstone, S. (1966). Elements of physical chemistry. Macmillan.
4. Atkins, P. W. (2001). Physical chemistry (7th ed.). Oxford University Press.
5. Kapoor, K. L. (1994). A textbook of physical chemistry (Vols. 4 & 5). Macmillan India Ltd.
6. Laidler, K. J. (1987). Chemical kinetics (3rd ed.). McGraw Hill.
7. Rajaraman, J., & Kuriacose, J. (1993). Kinetics and mechanism of chemical transformations. Macmillan India.
8. Turro, N. J. (1978). Molecular photochemistry. W. A. Benjamin, Inc.
9. Rohatgi-Mukherjee, K. K. (1978). Fundamentals of photochemistry. Wiley Eastern.
10. Dogra, S. K., & Dogra, S. (1996). Physical chemistry through problems (4th ed.). New Age International.
11. Kalidas, C., & Sangaranarayanan, M. V. (2019). Physical chemistry: Problems and solutions. Universities Press.

Unit IV

1. Jeffery, G. H., Bassett, J., Mendham, J., & Denney, R. C. (1999). Vogel's textbook of quantitative chemical analysis (5th ed.). Addison Wesley Longman Inc.
2. Day, R. A., & Underwood, A. L. (2004). Quantitative analysis (6th ed.). Prentice Hall of India.
3. Svehla, G. (1996). Vogel's qualitative inorganic analysis (7th ed.). Prentice Hall.
4. Morrison, R. T., & Boyd, R. N. (2011). Organic chemistry. Pearson Education.
5. Solomons, T. W. G., & Fryhle, C. B. (2016). Organic chemistry. Wiley.
6. Bruice, P. Y. (2017). Organic chemistry. Pearson Education.
7. Soni, P. L. (2012). Textbook of organic chemistry. Sultan Chand & Sons.
8. Levine, I. N. (2009). Physical chemistry (6th ed.). McGraw Hill.
9. Kapoor, K. L. (1994). A textbook of physical chemistry (Vols. 4 & 5). Macmillan India Ltd.
10. Atkins, P., & de Paula, J. (2010). Atkins' physical chemistry (9th ed.). Oxford University Press.
11. McQuarrie, D. A., & Simon, J. D. (1997). Physical chemistry: A molecular approach. Viva Books Pvt. Ltd.
12. Satake, M., Hayashi, Y., Mido, Y., Iqbal, S. A., & Sethi, M. S. (2014). Colloidal and surface chemistry. Discovery Publishing Pvt. Ltd.

Laboratory Course-I **30h (2h / week)**

Paper-I: Quantitative Analysis

Acid-Base Titrations

1. Estimation of Carbonate in Washing Soda.
2. Estimation of Bicarbonate in Baking Soda.
3. Estimation of Carbonate and Bicarbonate in the Mixture.
4. Estimation of Alkali content in Antacid using HCl.

Redox Titrations

1. Determination of Fe(II) using $K_2Cr_2O_7$
2. Determination of Fe(II) using $KMnO_4$ with sodium oxalate as primary standard.
3. Determination of Cu(II) using $Na_2S_2O_3$ with $K_2Cr_2O_7$ as primary standard

Complexometric Titrations

1. Estimation of Mg^{2+} by EDTA
2. Estimation of Cu^{2+} by EDTA

References

1. Jeffery, G. H., Bassett, J., Mendham, J., & Denney, R. C. (1999). Vogel's textbook of quantitative chemical analysis (5th ed.). Addison Wesley Longman Inc.
2. Vogel, A. I. Vogel's Textbook of Quantitative Chemical Analysis, 6th Edition, Pearson Education, 2000. ISBN: 9780582226289
3. Giri, A. N. (2010). A textbook of practical chemistry. Himalaya Publishing House.
4. O.P. Pandey, D.N. Bajpai, & S. Giri. (2020). Practical chemistry. 10th Revised Edition, S. Chand Publishing. ISBN: 9789352535859
5. Gopalan, R., Subramanian, P. S., & Raghavan, K. (2004). Elements of analytical chemistry. Sultan Chand & Sons.
6. Gopalan, R., Venkappayya, D., and Nagarajan, S. (2012). Textbook of Inorganic Chemistry (Lab Manual), 3rd Edition, Universities Press, Hyderabad, ISBN: 9788173718204
7. Ahluwalia, V. K., and Sunita Dhingra, (2005). A Laboratory Manual of Organic and Inorganic Chemistry, 1st Edition, University Press, Hyderabad, ISBN: 9788173715623

B.Sc I YEAR CHEMISTRY
SEMESTER WISE SYLLABUS
SEMESTER II
Paper – II
Chemistry – II

Unit-I (Inorganic Chemistry) **15h (1h/week)**

S2-I-1 Chemistry of d-block elements **7h**

Characteristics of d-block elements with special reference to electronic configuration, variable oxidation states, color properties, d-d spectral transitions, ability to form complexes, magnetic properties, calculation of magnetic moment-spin only formula & catalytic properties. Comparative treatment of second and third transition series with their 3d analogues.

S2-I-2: Chemistry of f-block elements **8h**

Chemistry of Lanthanides: Position in periodic table, electronic structure, oxidation state, ionic and atomic radii/ionic radii- lanthanide contraction- cause and consequences, anomalous behavior of post lanthanides-complexation-type of donor ligands preferred. Magnetic properties-paramagnetism, color and spectra, f-f transitions-occurrence and separation-ion exchange method, solvent extraction.

Chemistry of actinides: General features-electronic configuration, oxidation state, actinide contraction, color and complex formation. Comparison with lanthanides.

Unit - II (Organic Chemistry) **15h (1h/week)**

S2-O-1: Halogen compounds **4h**

Classification: alkyl (primary, secondary, tertiary), aryl, aralkyl,. Chemical reactivity - reduction, formation of RMgX, Nucleophilic substitution reactions – classification into S_N1 and S_N2. Mechanism and energy profile diagrams of S_N1 and S_N2 reactions. Stereochemistry of S_N2 (Walden Inversion) 2-bromobutane, S_N1 (Racemization) 1- bromo-1-phenylpropane.

S2-O-2: Hydroxy compounds and ethers **5h**

Alcohols: Preparation: 1°, 2° and 3° alcohols using Grignard reagent, Reduction of Carbonyl compounds, carboxylic acids and esters. Physical properties: H-bonding, Boiling point and Solubility. Reactions with Sodium, $HX/ZnCl_2$ (Lucas reagent), oxidation with conc. HNO_3 and Oppenauer oxidation (Mechanism).

Phenols: Preparation: (i) from diazonium salts of anilines and (ii) from benzene sulphonic acids. Properties: Acidic nature, formation of phenoxide and reaction with R-X, electrophilic substitution; halogenations, Riemer Tiemann reaction (Mechanism), Gattermann-Koch reaction, Schotten-Baumann reaction.

Ethers: Nomenclature, preparation by Williamson synthesis. Chemical properties – inert nature, action of conc. H_2SO_4.

S2-O-3 Carbonyl compounds **6h**

Preparation of aldehydes & ketones from acid chlorides, nitriles and carboxylic acids. Special methods of preparing aromatic aldehydes and ketones by Oxidation of arenes. Physical properties – absence of Hydrogen bonding. Reactivity of the carbonyl groups in aldehydes and ketones. Chemical reactivity: Addition of (a) $NaHSO_3$ (b) HCN (c) RMgX (d) 2,4-DNP (Schiff base). Addition of H_2O to form hydrate, addition of alcohols - hemi acetal and acetal formation. Cannizzaro reaction. Oxidation reactions – $KMnO_4$ oxidation, reduction – catalytic hydrogenation, mechanism of Clemmensen reduction, Meerwein-Ponndorf-Verley reduction.

Unit - III (Physical Chemistry) **15h (1h/week)**

S2-P-1: Electrochemistry **15h**

Revision of conductance, specific conductance, equivalent conductance and factors influencing conductance of electrolytes. Ionic mobility, definition and significance of transport number. Kohlrausch's law – its applications: determination of degree of dissociation and acid dissociation constant (K_a) of weak acids, solubility product determination and conductometric titrations. Ostwald's dilution law - its uses and limitations. Debye- Hückel -Onsager's equation for strong electrolytes (elementary treatment only).

Types of electrodes with examples - Types of reversible electrodes - the gas electrode, metal-metal ion, metal-insoluble salt, redox electrodes and ion-selective electrode. Reversible and irreversible cells; Nernst equation – EMF of a cell; representation of a cell-problems; electrode potentials-electrochemical series and its significance. Determination of pH – using quinhydrone and glass electrodes. Potentiometric titrations.

Unit – IV (General Chemistry) **15h (1h/week)**

S2-G-1: Chemical Bonding **5h**

Molecular orbital theory: Shapes and sign convention of atomic orbitals. Modes of bonds. Criteria for orbital overlap. LCAO concept. π and σ overlapping. Concept of Types of molecular orbitals: bonding, antibonding and non-bonding. MOED of homonuclear diatomic molecules - H_2, N_2, O_2, O_2^-, O_2^{2-}, F_2 (unhybridized diagrams only) and heteronuclear diatomics - CO, CN^-, NO, NO^+ and HF, their bond order, stability and magnetic properties.

S2-G-2: Stereoisomerism **5h**

Optical activity: Definition, wave nature of light, plane polarized light, optical rotation and specific rotation, chiral centers. Chiral molecules: definition and criteria - absence of plane, center and S_n axis of symmetry – asymmetric and dissymmetric molecules. Examples of asymmetric molecules (Glyceraldehyde, Lactic acid, Alanine) and dissymmetric molecules (trans-1,2-dichlorocyclopropane). Molecules with constitutionally symmetrical chiral carbons (Tartaric acid) Molecules with constitutionally unsymmetrical chiral carbons (2,3dibromopentane). D, L configuration – examples. R, S – configuration: Cahn-Ingold-Prelog (CIP) rules.

S2-G-3: Colligative Properties **5h**

Definition of colligative properties- relative lowering of vapour pressure-Raoult's law; Osmotic pressure; elevation of boiling point and depression of freezing point; thermodynamic relation between molecular weight and colligative property (derivations not required) -Problems.

References

General reference: B.Sc. I Year Chemistry : Semester II, Telugu Academy publication, Hyd.

Unit I

1. Puri, B. R., Sharma, L. R., & Kalia, M. S. (1996). Principles of inorganic chemistry. Vishal Publications.
2. Lee, J. D. (1981). Concise inorganic chemistry (3rd ed.). Oxford University Press.
3. Cotton, F. A., Wilkinson, G., & Gaus, P. L. (2001). Basic inorganic chemistry (3rd ed.). Wiley.
4. Greenwood, N. N., & Earnshaw, A. (1989). Chemistry of the elements. Pergamon Press.
5. Shriver, D. F., & Atkins, P. W. (1999). Inorganic chemistry (3rd ed.). Oxford University Press.
6. Huheey, J. E., Keiter, E. A., & Keiter, R. L. (1993). Inorganic chemistry: Principles of structure and reactivity (4th ed.). Harper Collins College Publishers.
7. Gopalan, R. (2009). Textbook of inorganic chemistry. Universities Press.

Unit II

1. Morrison, R. T., & Boyd, R. N. (2011). Organic chemistry. Pearson Education (Prentice Hall).
2. Solomons, T. W. G., & Fryhle, C. B. (2016). Organic chemistry. Wiley (John Wiley & Sons).
3. Bruice, P. Y. (2017). Organic chemistry. Pearson Education.
4. Wade, L. G., Jr. (2013). Organic chemistry. Pearson Education.
5. Jones, M., Jr. (2010). Organic chemistry. W. W. Norton & Company.
6. McMurry, J. (2015). Organic chemistry. Cengage Learning (Brooks/Cole).
7. Soni, P. L., & Soni, H. M. (2012). Organic chemistry. Sultan Chand & Sons.
8. Ghosh, S. K. (2009). General organic chemistry. Bharati Bhawan Publishers.
9. Pillai, C. N. (2008). Organic chemistry. Universities Press (India) Pvt. Ltd.

Unit III

1. Glasstone, S., & Lewis, D. (1966). Elements of physical chemistry. Macmillan.
2. Maron, S. H., & Lando, J. B. (1966). Fundamentals of physical chemistry. Macmillan Limited.
3. Puri, B. R., Sharma, L. R., & Pathania, M. S. (2013). Principles of physical chemistry (46th ed.). Vishal Publishing Company.
4. Atkins, P. W. (2001). Physical chemistry (7th ed.). Oxford University Press.
5. Kapoor, K. L. (2004). Physical chemistry (Vols. 3 & 5). Macmillan Publishers.
6. Sharma, K. K., & Sharma, L. K. (2012). A textbook of physical chemistry (5th ed.). Vikas Pub.
7. Dogra, S. K., & Dogra, S. (1996). Physical chemistry through problems (4th ed.). New Age Int.
8. Sangaranarayanan, M. V. & Mahadevan, V. (2011).Text Book of Physical chemistry. Univ. Press.

Unit IV

1. Day, R. A., & Underwood, A. L. (2004). Quantitative analysis (6th ed.). Prentice Hall of India.
2. Atkins, P. W. (2001). Physical chemistry (7th ed.). Oxford University Press.
3. Kapoor, K. L. (2004). Physical chemistry (Vols. 3 & 5). Macmillan Publishers.
4. Puri, B. R., Sharma, L. R., & Pathania, M. S. (2013). Principles of physical chemistry (46th ed.) Vishal Publishing Company.
5. Raj, G. (2009). Advanced physical chemistry (35th ed.). Goel Publishing House.

Laboratory Course-II **30h (2h / week)**

Paper II - Qualitative Analysis - Semi micro analysis of mixtures
Analysis of two anions (one simple, one interfering) and two cations in the given mixture.

Anions: CO_3^{2-} , SO_3^{2-} , S^{2-}, Cl^- , Br^-, I^-, CH_3COO^-, NO_3^-, PO_4^{3-}, BO_3^{3-}, SO_4^{2-}
Cations: Hg_2^{2+}, Ag^+, Pb^{2+},
Hg^{2+}, Bi^{3+}, Cd^{2+}, Cu^{2+}, As^{3+} / As^{5+} , Sb^{3+} / Sb^{5+}, Sn^{2+} / Sn^{4+},
Al^{3+}, Cr^{3+}, Fe^{3+}
Mn^{2+}, Co^{2+}, Ni^{2+}, Zn^{2+}
Ca^{2+}, Ba^{2+}, Sr^{2+}
Mg^{2+}, NH_4^+

References

1. Svehla, G. (1996). Vogel's qualitative inorganic analysis (7th ed.). Prentice Hall.
2. Gopalan, R., Subramanian, P. S., & Raghavan, K. (2004). Elements of analytical chemistry. Sultan Chand & Sons.
3. Ahluwalia, V. K., and Sunita Dhingra, (2005). A Laboratory Manual of Organic and Inorganic Chemistry, 1st Edition, University Press, Hyderabad, ISBN: 9788173715623
4. Giri, A. N. (2010). A textbook of practical chemistry. Himalaya Publishing House.
5. Sharma, R. K. (2013). Experiments and techniques in inorganic chemistry. Krishna Prakashan Media.
6. O.P. Pandey, D.N. Bajpai, & S. Giri. (2020). Practical chemistry. 10th Revised Edition, S. Chand Publishing. ISBN: 9789352535859.
7. Gopalan, R., Venkappayya, D., and Nagarajan, S. (2012). Textbook of Inorganic Chemistry (Lab Manual), 3rd Edition, Universities Press, Hyderabad, ISBN: 9788173718204
8. Vogel, A. I. and Svehla, G.Vogel's Textbook of Macro and Semi-Micro Qualitative Inorganic Analysis, 5th Edition, Longman Group Ltd., 1979. ISBN: 9780582446939

B.Sc II YEAR CHEMISTRY
SEMESTER WISE SYLLABUS
SEMESTER III
Paper-III
Chemistry - III

Unit-I (Inorganic Chemistry) **15h (1h/week)**

S3-I-1: Coordination Compounds-I **10h**

Simple inorganic molecules and coordination complexes. Nomenclature – IUPAC rules, 1. Coordination number, coordination geometries of metal ions, types of ligands. 2. Brief review of Werner's theory, Sidgwick's electronic interpretation and EAN rule and their limitations. (Valence bond theory (VBT) – postulates and application to (a) tetrahedral complexes $[Ni(NH_3)_4]^{2+}$, $[NiCl_4]^{2-}$ and $[Ni(CO)_4]$ (b) Square planar complexes $[Ni(CN)_4]^{2-}$, $[Cu(NH_3)_4]^{2+}$, $[PtCl_4]^{2-}$ (c) Octahedral complexes $[Fe(CN)_6]^{4-}$, $[Fe(CN)_6]^{3-}$, $[FeF_6]^{4-}$, $[Co(NH_3)_6]^{3+}$, $[CoF_6]^{3-}$. Limitations of VBT. 3. Isomerism in coordination compounds, stereo isomerism-(a) Geometrical isomerism in (i) Square planar metal complexes of the type$[MA_2B_2]$, $[MA_2BC]$, $[M(AB)_2]$, [MABCD]. (ii) Octahedral metal complexes of the type $[MA_4B_2]$, $[M(AA)_2B_2]$, $[MA_3B_3]$ using suitable examples, (b) Optical isomerism in (i). tetrahedral complexes [MABCD], (ii). Octahedral complexes $[M(AA)_2B_2]$, $[M(AA)_3]$ using suitable examples. Structural isomerism: ionization, linkage, coordination ligand isomerism using suitable examples.

S3-I-2: Metal Carbonyls and related compounds **2h**

Metal Carbonyls: Classification, Structural features of $Ni(CO)_4$, $Fe(CO)_5$, $Fe_2(CO)_9$, $Fe_3(CO)_{12}$ and $Cr(CO)_6$ -18 valence electron rule.

S3-I-3: Organometallic Chemistry **3h**

Definition, nomenclature and classification of organometallic compounds. Methods of preparation, properties and applications of alkyl and aryl compounds of Li & Mg.

Unit - II (Organic Chemistry) **15h (1h/week)**

S3-O-1: Carboxylic acids **6 h**

Preparation: (a) Hydrolysis of Nitriles, amides and esters. (b) Carbonation of Grignard reagents. Special methods of preparation of Aromatic Acids - Oxidation of Arenes. Physical properties-hydrogen bonding, dimeric association, Chemical properties – Reactions involving H, OH and COOH groups -salt formation, anhydride formation, Acid halide formation, Esterification (mechanism) & Amide formation. Reduction of acid to the corresponding primary alcohol - via ester or acid chloride. Arndt – Eistert synthesis, Halogenation by Hell – Volhard - Zelinsky reaction.