



Bhavan's Vivekananda College

Of Science, Humanities and Commerce

Autonomous College – Affiliated to Osmania University

Accredited with 'A' Grade by NAAC

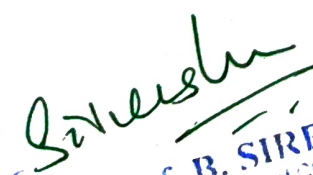
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CHEMISTRY SYLLABUS (2026-27)

CBCS SYSTEM


Prof. B. SIREESHA
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CREDITS IN CHEMISTRY

CHEMISTRY -MbGC,BTGC,BcNDC, BTMbC (2026-27)

FIRST YEAR-SEMESTER I				
CODE	COURSE TITLE	COURS E 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

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Syllabus - B Sc I Year Chemistry

(w.e.f academic year: 2026-27)

Semester I

Course: Chemistry I

Course Code: CT135(60 Hours)

Hour/week: 4

Credits: 4

Course Objectives: The objectives of this course are,

1. How elements in the p-block will behave and bond. Explain why some heavy elements (like Lead or Bismuth) don't react as expected. Identify How to make and name common compounds like Silicates and Diborane.
2. Build carbon chains using specific "Name Reactions". Compare how single, double, and triple bonds react differently. Identify "Aromatic" compounds (like Benzene) and explain why they are so stable compared to others
3. Calculate how fast a chemical reaction happens using math formulas. Determine the age of an object (like a fossil or rock) using Carbon Dating. Explain how light causes chemical changes in nature (like photosynthesis or glow-in-the-dark effects).
4. Describe how molecules stick to surfaces (Adsorption). Explain the science behind "Colloids" (like milk, fog, or smoke) and how they are used in factories. Identify how soaps and detergents work to clean surfaces.
5. Use "Semi-Micro" lab techniques to find out exactly which ions are in an unknown powder. Apply rules of solubility to separate different chemicals in a mixture.
6. Identify molecules that have the same formula but different shapes (Isomers). Distinguish between molecules that are mirror images of each other. Name 3D structures using the "R/S" or "E/Z" naming systems.

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^- .

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Pseudohalogens: Comparison with halogens.
Structure, bonding and reactivity of Xenon Compounds-Oxides, Halides and Oxyhalides.

15h (1

Unit - II (Organic Chemistry)
h/week)

5h

S1-O-1: Structural Theory in Organic Chemistry

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.

5h

S1-O-2: Acyclic Hydrocarbons

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 H₂O, HOX with mechanism and addition of HBr in the presence of peroxide (anti-Markovnikov's addition). Oxidation (cis-additions) hydroxylation by KMnO₄, OsO₄, 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 X₂, HX, H₂O (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.

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

15h

S1-P-1: Elementary quantum mechanics
3h

Limitations of classical mechanics and Origin of quantum mechanics-Black body radiation, 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.

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 $\text{H}_2\text{-Cl}_2$ and $\text{H}_2\text{-Br}_2$ 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)
(1h/week)

15h

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

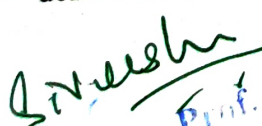
5h

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


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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.

Course Outcomes: By the end of the course, the students will be able to,

CT135.CO1: Predict the synthesis and bonding properties of p block elements
CT135.CO2: The students are expected to know the methods of C – C, C=C and C≡C bond formation, reagents and respective name reactions; the difference in reactivity of single, double and triple bonds; the meaning and use of reaction mechanisms with examples; the theory of aromaticity, aromatic compounds and their reactivity; difference from acyclic conjugated alkenes.

CT135.CO3: Solve problems on rate and rate constants. Calculate the age of rocks, carbon dating etc. Explain examples of the effects of photochemistry in nature and in various applications

CT135.CO4: Define and explain surface and interfacial phenomena. Demonstrate how colloids and surface chemistry is applied in industry and the environment.

CT135.CO5: Apply the knowledge of semi micro analysis in identification of ions in many substances

CT135.CO6: Focus on enabling students to define, classify and differentiate between structural isomers and stereoisomers

Books/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

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- 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.

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12. Satake, M., Hayashi, Y., Mido, Y., Iqbal, S. A., & Sethi, M. S. (2014). Colloidal and surface chemistry. Discovery Publishing Pvt.

Course: Quantitative Analysis Hour/week: 2

Course Code: CT135P (30 Hours)

Credits: 2

Course Objectives: The objectives of this course are,

1. To enable students to systematically determine the concentration of unknown ions/analytes by selecting and executing appropriate titrimetric methods, such as Acid-Base, Redox, or Complexometric titrations.
2. To develop the proficiency to execute multi-step titrations (like the estimation of carbonate in washing soda, Bicarbonate in Baking Soda or Mg^{2+} by EDTA) and accurately calculate the amount or mass of the analyte/ion using stoichiometric relationships and primary standards.

Laboratory Course-

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

Practical Course Outcomes: By the end of the course, the students will be able to,

CT135P.CO1P: Perform precise Acid-Base, Redox, and Complexometric titrations, including the preparation and standardization of reagents to ensure analytical accuracy.

CT135P.CO2P: Quantitatively estimate alkaline compounds and metal ions in pure and commercial samples using stoichiometric calculations and data interpretation.

Books/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

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Pragathi

- 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

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Syllabus - B Sc I Year Chemistry

(w.e.f academic year: 2026-27)

Semester II

Course: Chemistry II

Hour/week: 4

Course Code: CT235(60 Hours)

Credits: 4

Course Objectives: The objectives of this course are,

1. Explain the characteristic properties of d-block and f-block elements, including electronic configurations, variable oxidation states, and the causes/consequences of Lanthanide and Actinide contractions.
2. Apply the principles of Nucleophilic Substitution (SN1 and SN2) and various name reactions (like Rierner-Tiemann or Cannizzaro) to predict the products and stereochemical outcomes of organic transformations.
3. Utilize mathematical models such as the Nernst equation, Kohlrausch's law, and Raoult's law to solve quantitative problems involving cell EMF, ionic mobility, and colligative properties.
4. Analyze the stability, bond order, and magnetic behavior of homonuclear and heteronuclear diatomic molecules by constructing and interpreting Molecular Orbital Energy Diagrams (MOED).
5. Categorize organic molecules based on stereoisomerism, distinguishing between asymmetric and dissymmetric structures, and assigning precise R/S and D/L configurations using CIP priority rules.
6. Evaluate the comparative chemistry of 3d, 4d, and 5d transition series and contrast the properties of Lanthanides with Actinides to justify their positions in the periodic table.

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

15h

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.

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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) (1h/week)

15h

S2-O-1: Halogen compound

4h

Classification: alkyl (primary, secondary, tertiary), aryl, aralkyl,. Chemical reactivity - reduction, formation of RMgX , Nucleophilic substitution reactions – classification into S_N^1 and S_N^2 . Mechanism and energy profile diagrams of S_N^1 and S_N^2 reactions. Stereochemistry of S_N^2 (Walden Inversion) 2-bromobutane, S_N^1 (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, Reimer Tiemann reaction (Mechanism), Gattermann-Koch reaction, Schotten-Baumann reaction.

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

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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.

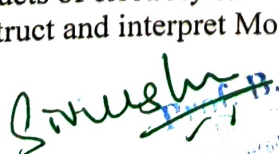
Course Outcomes: By the end of the course, the students will be able to,

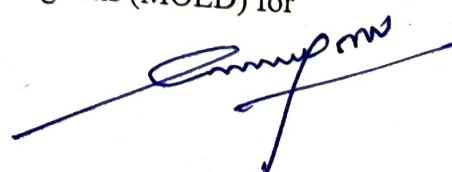
CT235.CO1: Analyze the periodic trends of d-block and f-block elements to explain their magnetic properties, color (d-d/f-f transitions), and the structural consequences of lanthanide/actinide contractions.

CT235.CO2: Apply reaction mechanisms (SN_1 , SN_2) and stereochemical principles (Walden Inversion, Racemization) to determine the products and pathways of halogen and hydroxy compound transformations.

CT235.CO3: Evaluate electrochemical systems by using the Nernst equation to calculate EMF and applying Kohlrausch's law to determine the dissociation constants and solubility products of electrolytes.

CT235.CO4: Construct and interpret Molecular Orbital Energy Diagrams (MOED) for


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homonuclear and heteronuclear diatomic molecules to conclude their bond order, stability, and magnetic nature.
 CT235.CO5: Distinguish between chiral, asymmetric, and dissymmetric molecules and assign precise R/S and D/L configurations to complex organic structures using CIP priority rules.
 CT235.CO6: Correlate colligative properties with thermodynamic relations to calculate the molecular weights of non-volatile solutes and explain deviations from Raoult's Law.

Books/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. Solomonis, 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.

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- Sharma, K. K., & Sharma, L. K. (2012). A textbook of physical chemistry (5th ed.). Vikas Pub.
- Dogra, S. K., & Dogra, S. (1996). Physical chemistry through problems (4th ed.). New Age Int.
- Sangaranarayanan, M. V. & Mahadevan, V. (2011). Text Book of Physical chemistry. Univ. Press.

Unit IV

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

Course: Qualitative Analysis **Hour/week:** 2

Course Code: CT235P (30 Hours)

Credits: 2

Course Objectives: The objectives of this course are,

- To enable students to systematically identify and distinguish between various anions and cations by executing a logical sequence of preliminary tests, group separation, and confirmatory tests.
- To accurately execute confirmatory tests for a range of anions and cations (such as CO_3^{2-} , Cl^- , Pb^{2+} , or NH_4^+) by observing and recording specific chemical changes like colour shifts, precipitate formation, or gas evolution to verify the ion's identity.

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^+

Practical Course Outcomes: By the end of the course, the students will be able to,

CT235P.CO1P: Execute a systematic semi-micro analytical scheme to identify two cations and two anions in an inorganic mixture, through a logical sequence of group separations and preliminary tests.

CT235P.CO2P: Verify the presence of specific ions (such as CO_3^{2-} , Cl^- , Pb^{2+} , or NH_4^+) by

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interpreting experimental observations—including color changes, precipitate formation, and gas evolution—during confirmatory tests.

Books/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

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Bharatiya Vidya
Bhavan

**BHAVAN'S VIVEKANANDA COLLEGE OF SCIENCE, HUMANITIES AND
COMMERCE, SAINIKPURI, SECUNDERABAD.**

Autonomous College

Affiliated to OSMANIA UNIVERSITY, Hyderabad.

(Accredited with 'A' grade by NAAC)

Department of Chemistry –AY 2026-27

Semester I

Course: Chemistry I (CT135)

This course leads to employability in Industrial Manufacturing and R&D by providing the knowledge of the structure and reactivity of inorganic elements which is essential for manufacturing high-performance materials. Knowledge of name reactions, bond polarization, inductive effects, carbon dating and chemical kinetics enables students to chemists in drug development labs, environmental & Geological Research.

Course: Quantitative Analysis (CT135P)

This content of the syllabus has employability in Quality Control (QC) and quality assurance (QA) as analytical chemists. This specific ability to estimate various ions play a major role in consumer good safety and environmental monitoring. It is a vital skill for water quality assessment and environmental protection agencies.

Semester II

Course: Chemistry II (CT235)

This course leads to employability in Advanced Materials and energy, by understanding the properties of d-block and f-block elements. The knowledge of SN1/SN2 mechanisms and Stereoisomerism (R/S and D/L configurations) is mandatory for pharmaceutical roles where R & D department of pharmaceutical laboratories.

Course: Qualitative Analysis (CT235P)

This content of the syllabus has employability in Forensic Science and Chemical Identification by the use of semi-micro analytical schemes to identify unknown anions and cations is a standard procedure in forensic labs to detect toxins or unknown powders. This skill enables students to Performing confirmatory tests that observe color changes, precipitate formation, or gas evolution enables graduates to verify the presence of regulated ions (like Nitrates or Phosphates) in industrial runoff and work as Safety Compliance Officers.

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Scheme of CIA

(w.e.f academic year: 2026-27)

Internal Assessment: 30 Marks

Internal Assessment: 30 Marks					
S No	Assessment type	Marks Assigned	Total Marks	Averaging of marks	Final marks allocation
1	CIA1			Average of CIA1 and CIA2	20
	a) MCQs: 10 bits (1/2 marks each)	5	20		
	b) Case Study Analysis/Problem based analysis	5			
	c) Short Answer type questions: To answer 2 out of 3 (5marks each)	10			
2	CIA2				
	Long answer type questions: 2 questions with internal choice in each(10 marks each)	20	20		
3	Assignment – Written assignment	5	5		5
4	Seminar	5	5	Average of Seminar & Group activity	5
5	Group Activity	5	5		
	Total Internal marks				30

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SEMESTER END EXAMINATIONS

B.Sc. – Electronics

(To be implemented from 2026 – 27)

Model Question Paper with Blooms Taxonomy Levels

The following weightage may be ensured while framing questions considering Bloom's taxonomy levels

Questions must be included to assess all the COs (Course Outcomes)

Level 1	Remembering	Fundamental Knowledge	60%
Level 2	Understanding		
Level 3	Applying	Knowledge on Application & Analysis	25-30%
Level 4	Analyzing		
Level 5	Evaluation	Design and Development	10-15%
Level 6	Creating		

Duration: 3hrs

Max Marks: 70

Note:

Answer any **Six** questions from Part A and Answer **all** questions from Part B.
Scientific calculators allowed.

Answer **any Six** questions

Part A

6 X 5 = 30

Q No	Unit	Blooms Taxonomy Level	CO
1	Unit 1		
2	Unit 1		
3	Unit 2		
4	Unit 2		
5	Unit 3		
6	Unit 3		
7	Unit 4		
8	Unit 4		

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Part – B

Answer all Questions

10X4=40

Q No	Unit	Blooms Taxonomy Level	CO
11	Unit 1		
	Or		
12	Unit 1		
13	Unit 2		
	Or		
14	Unit 2		
15	Unit 3		
	Or		
16	Unit 3		
17	Unit 4		
	Or		
18	Unit 4		

Summary (to be filled in by the Question paper setter)

Kindly give the percentage of each of the criteria followed in framing the question paper

Level 1 & Level 2	Remembering & Understanding	Fundamental Knowledge	
Level 3 & Level 4	Applying & Analyzing	Knowledge on Application & Analysis	
Level 5 & Level 6	Evaluation & Creating	Design and Development	

Note: Minimum of 4 Levels of Bloom's Taxonomy must be covered in the question paper

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CHEMISTRY SYLLABUS (2026-27)

CBCS SYSTEM

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CREDITS IN CHEMISTRY

CHEMISTRY -MbGC,BTGC,BcNDC, BT.MbC (2026-27)

II YEAR SEMESTER-III				
CODE	COURSE TITLE	COURSE TYPE	HPW	CREDITS
CT335	CHEMISTRY III	DSC-3C	4T+3P=7	4+1=5
CT335P	ORGANIC SYNTHESIS			
SE335	SAFETY IN CHEMISTRY LABORATORY AND PREPARING LAB REAGENTS	SEC-1	2	2
	COMMUNICATIVE ENGLISH	SEC-2	2	2
			11	9
CODE	COURSE TITLE	COURSE TYPE	HPW	CREDITS
CT435	CHEMISTRY IV	DSC-3D	4T+3P=7	4+1=5
CT435P	QUALITATIVE ANALYSIS OF ORGANIC COMPOUND			
SE435	CHEMINFORMATICS	SEC-3	2	2
	UNIVERSAL HUMAN VALUES	SEC-4	2	2
			11	9

III YEAR SEMESTER-V				
CODE	COURSE TITLE	COURSE TYPE	HPW	CREDITS
GE535	CHEMISTRY OF COSMETICS, FOOD PROCESSING, DRUGS & PHARMACEUTICALS	GE-1	4	4
CT535	SPECTROSCOPY & CHROMATOGRAPHY	DSC-3E	4T+3P=7	4+1=5
CT535A	METALLURGY, DYES & CATALYSIS TECHNIQUES, ANALYSIS OF WATER.			
CT535P	PHYSICAL CHEMISTRY - I			
			11	9

III YEAR SEMESTER-VI				
CODE	COURSE TITLE	COURSE TYPE	HPW	CREDITS
CT635_O/CT635_PW	ADVANCED CHEMISTRY/ PROJECT IN CHEMISTRY	DSC-3F	4T+3P=7	4
CT635A	MEDICINAL CHEMISTRY			4+1=5
CT635B	AGRICULTURAL & FUEL CHEMISTRY			
CT635P	PHYSICAL CHEMISTRY PRACTICALS - II			
			7	9

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