B.Sc I Yr Chemistry
Semester Wise Syllabus
Semester II
Paper – II
Chemistry – II

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

S2-I-1 p-block Elements -II 7 h

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

**Oxy acids:** Structure and acidic nature of oxyacids of B, C, N, P, S, Cl and I. Redox properties of oxyacids of Nitrogen: HNO₂ (reaction with FeSO₄, KMnO₄, K₂Cr₂O₇), HNO₃ (reaction with H₂S, Cu), HNO₄ (reaction with KBr, Aniline), H₂N₂O₄ (reaction with KMnO₄). Redox properties of oxyacids of Phosphorus: H₃PO₂ (reaction with HgCl₂), H₃PO₃ (reaction with AgNO₃, CuSO₄). Redox properties of oxyacids of Sulphur: H₂SO₃ (reaction with KMnO₄, K₂Cr₂O₇), H₂SO₄ (reaction with Zn, Fe, Cu), H₂S₂O₃ (reaction with Cu, Au), H₂SO₃ (reaction with KI, FeSO₄), H₂S₂O₅ (reaction with FeSO₄, KI). Redox properties of oxy acids of Chlorine.

**Interhalogens:** Classification- general preparation- structures of AB, AB₃, AB₅ and AB₇ type and reactivity.

**Poly halides:** Definition and structure of ICl₂, ICl₄ and I₃.

**Pseudohalogen:** Comparision with halogens.

S2-I-2: Chemistry of Zero group elements 2 h

Isolation of noble gases, Structure, bonding and reactivity of Xenon compounds – Oxides, Halides and Oxy-halides. Clatherate compounds and Anomalous behavior of He (II)

S2-I-3: Chemistry of d-block elements 6 h


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

S2-O-1: Halogen compounds 4 hrs


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Unit - IV (General Chemistry)  

S1-G-1. General Principles of Inorganic Qualitative Analysis  

Anion analysis: Theory of sodium carbonate extract, classification and reactions of anions - $CO_3^{2-}$, $Cl^-$, $Br^-$, $SO_4^{2-}$, $PO_4^{3-}$, $BO_3^{3-}$, $CH_3COO^-$, $NO_3^-$. Interfering ions. Cation Analysis: Principles involved - Solubility product, common ion effect, general discussion for the separation and identification of group I individual cations ($Hg^{2+}$, $Ag^+$, $Pb^{2+}$) with flow chart and chemical equations. Principle involved in separation of group II & IV cations. General discussion for the separation and identification of group II ($Hg^{2+}$, $Pb^{2+}$, $Bi^{3+}$, $Cd^{2+}$, $Sb^{3+}$), III ($Al^{3+}$, $Fe^{3+}$), IV ($Mn^{2+}$, $Zn^{2+}$) individual cations with flow chart and chemical equations. General discussion for the separation and identification of group V individual cations ($Ba^{2+}$, $Sr^{2+}$, $Ca^{2+}$) with flow chart and chemical equations. Theory of flame test. Identification of Group VI cations ($Mg^{2+}$, $NH_4^+$).

S1-G-2. Isomerism  


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. Cyclic compounds: Baeyer's strain theory, Conformational analysis of cyclohexane.

Cis-trans isomerism: E-Z-Nomenclature

S1-G-3: Solid state Chemistry  


References  

General reference: B.Sc I Year Chemistry : Semester I, Telugu Academy publication, Hyd  Unit-I  
2. Concise Inorganic Chemistry by J.D. Lee 3rd edn.  
anti addition - peracids (via epoxidation), hydroboration, ozonolysis – location of double bond.
Dienes - Types of dienes, reactions of conjugated dienes - 1,2 and 1,4 addition of HBr to 1,3 –
butadiene and Diels – Alder reaction.

Alkynes - Preparation by dehydrohalogenation of vicinal dihalides, dehalogénation of
tetrahalides. Physical Properties: Chemical reactivity - electrophilic addition of X₂, HX, H₂O
(tautomerism), Oxidation (formation of enediol, 1,2 dienes and carboxylic acids) and reduction
(Metal-ammonia reduction, catalytic hydrogenation).

Aromatic Hydrocarbons

4h

Introduction to aromaticity: Huckel’s rule – Benzene, Naphthalene and Anthracene. Reactions -
General mechanism of electrophilic substitution, mechanism of nitration, sulphonation and
halogenation, Friedel Craft’s 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(1 hr/week)

S1-P-1: Atomic structure and elementary quantum mechanics

3 h

Black body radiation, heat capacities of solids, Rayleigh Jeans law, Planck’s radiation law,
photoelectric effect, Limitations of classical mechanics, Compton effect, de Broglie’s hypothesis.
Heisenberg’s uncertainty principle.

S1-P-2: Gaseous State

5 h
Deviation of real gases from ideal behavior. van der Waals equation of state. Critical
phenomenon. PV isotherms of real gases, continuity of state. Andrews’s isotherms of CO₂. The
van der Waal’s equation and critical state. Derivation of relationship between critical constants
and var der Waal’s constants. The law of corresponding states, reduced equation of states. Joule
Thomson effect and inversion temperature of a gas. Liquifaction of gases: i) Linde’s method
based on Joule Thomson effect ii) Claude’s method based on adiabatic expansion of a gas.

S1-P-3: Liquid State and Solutions

4h

Liquid State
Intermolecular forces, structure of liquids (qualitative description). Structural differences
between solids, liquids and gases. Surface tension and its determination using stagaometer.
Viscosity of a liquid and determination of coefficient of viscosity using Ostwald viscometer.
Effect of temperature on surface tension and coefficient of viscosity of a liquid (qualitative
treatment only).

Solutions
Liquid - liquid mixtures, ideal liquid mixtures, Raoult’s and Henry’s laws. Non ideal systems.
Azeotropes: HCl-H₂O and C₂H₅OH - H₂O systems. Fractional distillation. Partially miscible
S2-O-2: Hydroxy compounds and ethers

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/ZnCl₂ (Lucas reagent), esterification, oxidation with PCC, alk. KMnO₄, acidic dichromates, conc. HNO₃ and Oppenauer oxidation (Mechanism).

Phenols: Preparation: (i) from diazonium salts of anilines, (ii) from benzene sulphonic acids and (iii) Cumene hydroperoxide.

Properties: Acidic nature, formation of phenoxide and reaction with R-X, electrophilic substitution; halogenations, Riemer Tiemann reaction (Mechanism), Kolbe reaction (Mechanism), Gattermann-Koch reaction, Azou-coupling reaction, Schotton-Boumann reaction, Houben-Hoesch condensation.


S2-O-3 Carbonyl compounds

Preparation of aldehydes & ketones from acid chloride, 1,3-dithianes, nitriles and from carboxylic acids. Special methods of preparing aromatic aldehydes and ketones by (a) Oxidation of arenes (b) Hydrolysis of benzal halides Physical properties – absence of Hydrogen bonding. Reactivity of the carbonyl groups in aldehydes and ketones. Chemical reactivity: Addition of (a) NaHSO₃ (b) HCN (c) RMgX (d) NH₃ (e) RNH₂ (f) NH₂OH (g) PhNHNH₂ (h) 2,4-DNP (Schiff bases). Addition of H₂O to form hydrate, chloral hydrate (stable), addition of alcohols - hemi acetal and acetal formation. Cannizaro reaction. Oxidation reactions – KMnO₄ oxidation and auto oxidation, reduction – catalytic hydrogenation, mechanism of Clemmenson’s reduction, Wolff-kishner reduction, Meerwein Pondoff Verly reduction. Reduction with LAH, NaBH₄.

Unit - III (Physical Chemistry)

S2-P-1: Electrochemistry

Electrical transport – conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance, measurement of equivalent conductance, variation of specific and equivalent conductance with dilution. Migration of ions and Kholrausch’s law, Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes, Ostwald’s dilution law - its uses and limitations. Debye-Huckel-Onsagar’s equation for strong electrolytes (elementary treatment only). Transport number, definition and determination by Hittorf’s method for attackable electrodes. Applications of conductivity measurements: Determination of degree of dissociation, determination of Ka of acids, determination of solubility product of a sparingly soluble salt, conductometric titrations.

Electrolytic and Galvanic cells – reversible and irreversible cells, conventional representation of electrochemical cells. Electro motive force (EMF) of a cell and its measurement. Computation of EMF. Types of reversible electrodes - the gas electrode, metal-metal ion, metal-insoluble

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

S2-G-1: Theory of Quantitative Analysis 6 hours


*Gravimetric analysis*: Introduction, nucleation, precipitation, growth of precipitate, filtration and washing, drying and incineration of precipitate, coprecipitation and post precipitation. Determination of Ni^{2+}.

S2-G-2: Stereoisomerism 5h


S2-G-3: Dilute Solutions & Colligative Properties 4 h

Dilute Solutions, Colligative Properties, Raoult’s law, relative lowering of vapour pressure, molecular weight determination. Osmosis - laws of osmotic pressure, its measurement, determination of molecular weight from osmotic pressure. Elevation of boiling point and depression of freezing point. Derivation of relation between molecular weight and elevation in boiling point and depression in freezing point.
References

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

**Unit I**
2. Concise Inorganic Chemistry by J.D. Lee 3rd edn.

**Unit II**
3. Organic Chemistry by Bruice Yurianis Powla.
5. Organic Chemistry by M. Jones, Jr
8. General Organic chemistry by Sachin Kumar Ghosh.
9. Organic Chemistry by C N pillai

**Unit III**
1. Physical chemistry by P W Atkins
2. Principles of physical chemistry by Prutton and Marron.
3. Text Book of Physical Chemistry by Soni and Dharmahara.
4. Text Book of Physical Chemistry by Puri and Sharma
5. Text Book of Physical Chemistry by K. L. Kapoor
7. Elements of Physical Chemistry by Lewis and Glasstone.
8. Material science by Kakani & Kakani

**Unit IV**
2. Quantitative Analysis by Day and Underwood Prentice Hall (India) VI Edn.
6. Practical chemistry by V K Ahluwalia, Sunitha Dhingra and Adarsh Gulati.

**Laboratory Course**

**Paper II- Quantitative Analysis**

**Acid - Base titrations**
2. Estimation of Bicarbonate in Baking Soda.
3. Estimation of Carbonate and Bicarbonate in the Mixture.

45hrs (3 h / week)