

THIRD SEMESTER

Code : **CHT-301**

Univ Code :301

Contact Hours :54

Work load : 4 hours per week

Credit Points :

Evaluation: Continuous Internal Assessment - 30 marks

Semester and Examination - 70 marks

PAPER-3

UNIT-I:INORGANIC CHEMISTRY-3

18 Hours

d-block elements

08 hours

Introduction and definition, position in the periodic table, occurrence.

Chemistry of the elements of first transition series: electron configuration, ionic radii, ionization energy, density, melting point, oxidation states & their stability, magnetic properties, color of compounds and catalytic properties.

Chemistry of the elements of second & third transition series: comparative treatment of 4d & 5d series elements with their 3d analogues in respect of electron configurations, ionic radii, oxidation states, magnetic behavior, color and catalytic properties.

Chemistry of lanthanides & Actinides

05 hours

Lanthanides: Electronic configurations, ionic radii & lanthanide contraction, spectral, magnetic properties, oxidation states, basic character. Separation of lanthanides by ion exchange method.

Actinides: Introduction, electronic configurations, ionic size, oxidation states, color & spectra, magnetic properties, formation of complexes, comparison with lanthanides.

Acids & bases

06 hours

Bronsted – Lowry concept, conjugate acids & bases, relative strength of acids & bases, leveling solvents. Solvent system concept, solvolytic behavior & limitations. Lux-Flood concept & Limitations. Lewis concept, success & limitations. Usanovich concept.

Hard & soft acids & bases, Pearson's HSAB principle, acid-base strength and hardness. softness, symbiosis, Electronegativity & hardness and softness Theories of hardness & softness.

UNIT-II: ORGANIC CHEMISTRY-3**18 Hours****Organic halogen compounds****06 hours**

Alkyl halides, alkenyl halides & acyl halides-definition with examples.

Alkyl halides: Classification with examples. Mechanism of SN^1 and SN^2 reactions by taking hydrolysis of tertiary butyl bromide and methyl bromide as examples. E^1 and E^2 reactions of alkyl halides with mechanism.

Aryl halides: Methods of formation, Nucleophilic displacement reactions with NaOH, NH_3 and

KCN. Wurtz-Fitting reaction and Ullmann reaction (C_6H_5Cl)

Alcohols**03 hours**

Classification with examples. Monohydric alcohols-classification with examples. Isomerism in monohydric alcohols up to C_5 . Methods of preparation of monohydric alcohols by hydrolysis of alkyl halides, hydroboration-oxidation of alkenes and reduction of aldehydes and ketones. Distinguishing tests for primary, secondary and tertiary alcohols by Lucas test and dichromate test. Mechanism of pinacol-pinacolone rearrangement.

Phenols**03 hours**

Classification with examples, manufacture of phenol by Cumene and Dow process. Acidity of phenol. Effect of substituents on acidity. Mechanism of Reimer-Tiemann and Kolbe reactions. Gattermann reaction and Fries rearrangement (mechanism not expected).

Carboxylic acids and acid derivatives**06 hours**

Carboxylic acids: Introduction, Classification into aliphatic & aromatic acids with examples. Methods of preparation of aliphatic monocarboxylic acids from alcohols, cyanides, esters and Grignard reagent. Acidity of carboxylic acids. Effect of substituents on acidity. Reactions of acids (salt formation, formation of acid halides, esters and amides) Hell-Volhard-Zelinsky (HVZ) reaction.

Acid derivatives: Definition with examples of different acid derivatives of acids. Preparation and reactions of acid chloride (acetyl chloride) and acid amides (acetamide may be taken as example).

UNIT-III: PHYSICAL CHEMISTRY-3 18 Hours Quantum mechanics 06 hours

Black body radiation, Planck's radiation law, photoelectric effect, Compton effect, De-Broglie hypothesis, Heisenberg's uncertainty principle, Derivation of Schrodinger's fundamental wave equation. Significance of wave equation, Eigen values, postulates of quantum mechanics.

Thermodynamics

07 hours

Limitations of first law of thermodynamics. Need for second law, spontaneous process, Statements of the second law of thermodynamics, Carnot cycle and its efficiency, Carnot theorem, concept of entropy, entropy as a state function. Physical significance of entropy, Free energy – Gibb's & Helmholtz free energies. Derivation of Gibb's-Helmholtz equation. ΔG as a criteria for spontaneity & equilibrium

Third law of thermodynamics: Nernst heat theorem, Statement of third law and concept of residual entropies.

Adsorption

03 hours

Langmuir's adsorption isotherm their significance, BET equation (no derivation). Application of BET equation in the determination of surface area of adsorbent.

Distribution law

02 hours

Statement, modification of the law when the solute undergoes association and dissociation in one of the solvents.

Code : **CHP-301**

Univ Code :301

Contact Hours :84

Work load : 4 hours per week

Credit Points :

Evaluation: Continuous Internal Assessment - 10 marks

Semester and Examination - 40 marks (30 marks for examination, 05 marks for Practical record and 05 marks for viva-voce)

LABORATORY COURSE-3

84 Hours

Inorganic semimicro qualitative analysis of binary mixture

- Systematic semimicro qualitative analysis of mixture of two simple inorganic salts (containing two basic radicals and two acidic radicals).
- Minimum 18 mixtures should be given for analysis.
 - In the beginning two practical durations may be used for instructions and demonstration of semi micro qualitative analysis of binary mixture.
 - Instructions should cover the explanation of basic principles of scheme of qualitative analysis: Solubility, solubility product principle, common ion effect, complex formation etc. and various reaction equations for acidic radicals tests, basic radicals group precipitations, group analyses and cause of flame coloration.

The following radicals may be given for analysis with suitable combination

- Acidic radicals: CO_3^{2-} , Cl^- , Br^- , I^- , NO_3^- , SO_4^{2-} , BO_3^{3-} , acetate & oxalate
- Basic radicals: NH_4^+ , Cu^{2+} , Bi^{3+} , Al^{3+} , Fe^{3+} , Cr^{3+} , Mn^{2+} , Zn^{2+} , Ni^{2+} , Co^{2+} , Ba^{2+} ,
ii. Mixture of Cl^- & I^- , Cl^- & Br^- , NO_3^- & Br^- , NO_3^- & I^- , should be avoided. SO_4^{2-} with Ba^{2+} , Ca^{2+} & Sr^{2+} should be avoided.