SEMESTER - III

Paper III (INORGANIC & ORGANIC CHEMISTRY) 60 hrs (4 h / w)

30 hrs (2h / w)

INORGANIC CHEMISTRY

UNIT –I

1. Chemistry of d-block elements: 9h

Characteristics of d-block elements with special reference to electronic configuration, variable valence, magnetic properties, catalytic properties and ability to form complexes. Stability of various oxidation states

2. Theories of bonding in metals: 6h

Metallic properties and its limitations, Valence bond theory, Free electron theory, Explanation of thermal and electrical conductivity of metals, limitations, Band theory, formation of bands, explanation of conductors, semiconductors and insulators.

UNIT – II

3.Metal carbonyls : 7h

EAN rule, classification of metal carbonyls, structures and shapes of metal carbonyls of V, Cr, Mn, Fe, Co and Ni.

4. Chemistry of f-block elements: 8h

Chemistry of lanthanides - electronic structure, oxidation states, lanthanide contraction, consequences of lanthanide contraction, magnetic properties. Chemistry of actinides - electronic configuration, oxidation states, actinide contraction, comparison of lanthanides and actinides.

ORGANIC CHEMISTRY

30 h (2h/w)

UNIT – III

1. Halogen compounds 5 h

Nomenclature and classification of alkyl (into primary, secondary, tertiary), aryl, aryl alkyl, allyl, vinyl, benzyl halides.

Nucleophilic aliphatic substitution reaction- classification into SN^1 and SN^2 – reaction mechanism with examples – Ethyl chloride, t-butyl chloride and optically active alkyl halide 2-bromobutane.

2. Hydroxy compounds 5 h

Nomenclature and classification of hydroxy compounds.

Alcohols: Preparation with hydroboration reaction, Grignard synthesis of alcohols. Phenols: Preparation i) from diazonium salt, ii) from aryl sulphonates, iii) from cumene. Physical properties- Hydrogen bonding (intermolecular and intramolecular). Effect of hydrogen bonding on boiling point and solubility in water.

Identification of alcohols by oxidation with $KMnO_4$, Ceric ammonium nitrate, Luca's reagent and phenols by reaction with $FeCl_3$.

Chemical properties:

a) Dehydration of alcohols.

b) Oxidation of alcohols by CrO_3, $KMnO_4$.

c) Special reaction of phenols: Bromination, Kolbe-Schmidt reaction, Riemer-Tiemann reaction, Fries rearrangement, azocoupling, Pinacol-Pinacolone rearrangement.

UNIT-IV

Carbonyl compounds 10 h

Nomenclature of aliphatic and aromatic carbonyl compounds, structure of the carbonyl group. Synthesis of aldehydes from acid chlorides, synthesis of aldehydes and ketones using 1,3-dithianes, synthesis of ketones from nitriles and from carboxylic acids. Physical properties: Reactivity of carbonyl group in aldehydes and ketones.

Nucleophilic addition reaction with a) $NaHSO_3$, b) HCN, c) RMgX, d) NH_2OH, e)$PhNHNH_2$, f) 2,4 DNPH, g) Alcohols-formation of hemiacetal and acetal. Base catalysed reactions: a) Aldol, b) Cannizzaro's reaction, c) Perkin reaction, d) Benzoin condensation, e) Haloform reaction, f) Knoevenagel reaction. Oxidation of aldehydes-Baeyer-Villiger oxidation of ketones.Reduction: Clemmensen reduction, Wolf-Kishner reduction, MPV reduction, reduction with $LiAlH_4$ and $NaBH_4$. Analysis of aldehydes and ketones with a) 2,4-DNPH test, b) Tollen's test, c) Fehling test, d) Schiff's test e) Haloform test (with equation)

UNIT-V

1. Carboxylic acids and derivatives 6 h

Nomenclature, classification and structure of carboxylic acids. Methods of preparation by a) Hydrolysis of nitriles, amides b) Hydrolysis of esters by acids and bases with mechanism c) Carbonation of Grignard reagents. Special methods of preparation of aromatic acids by a) Oxidation of side chain. b) Hydrolysis by benzotrichlorides.

c) Kolbe reaction. **Physical properties**: Hydrogen bonding, dimeric association, acidity-strength of acids with examples of trimethyl acetic acid and trichloroacetic acid. Relative differences in the acidities of aromatic and aliphatic acids. **Chemical properties**: Reactions involving H, OH and COOH groups- salt formation, anhydride formation, acid chloride formation, amide formation and esterification (mechanism). Degradation of carboxylic acids by Huns-Diecker reaction, decarboxylation by Schimdt reaction, Arndt-Eistert synthesis, halogenation by Hell- Volhard- Zelinsky reaction.

2. Active methylene compounds **4 h**

Acetoacetic ester: keto-enol tautomerism, preparation by Claisen condensation, Acid hydrolysis and ketonic hydrolysis. Preparation of a) monocarboxylic acids. b) Dicarboxylic acids. c) Reaction with urea

Malonic ester: preparation from acetic acid. **Synthetic applications**: Preparation of a) monocarboxylic acids (propionic acid and n-butyric acid). b) Dicarboxylic acids (succinic acid and adipic acid) c) α,β-unsaturated carboxylic acids (crotonic acid). d) Reaction with urea.

List of Reference Books

1. Selected topics in inorganic chemistry by W.D.Malik, G..D.Tuli,R.D.Madan
2. Inorganic Chemistry J E Huheey, E A Keiter and R L Keiter
3. A Text Book of Organic Chemistry by Bahl and Arun bahl
4. A Text Book of Organic chemistry by I L Finar Vol I
5. Organic chemistry by Bruice
6. Organic chemistry by Clayden
7. Advanced Inorganic chemistry by Gurudeep Raj
8. Basic Inorganic Chemistry by Cotton and Wilkinson
9. Concise Inorganic Chemistry by J.D.Lee

LABORATORY COURSE -III **30 hrs. (3 h / w)**

Practical Paper-III

Titrimetric analysis and **Organic Functional Group Reactions**

(At the end of Semester-III)

Internal - 25M

Titrimetric analysis: **10M**

1. Determination of Fe (II) using $KMnO_4$ with oxalic acid as primary standard.
2. Determination of Cu(II) using $Na_2S_2O_3$ with $K_2Cr_2O_7$ as primary standard.

Organic Functional Group Reactions **10M**

3. Reactions of the following functional groups present in organic compounds (at least four) Alcohols, Phenols, Aldehydes, Ketones, Carboxylic acids and Amides

External

Record **5M**

Practical scheme of Valuation

I	Practical Examination		
		Titrimetric Analysis	
	1.	Brief Procedure	2 ½ M
	2.	Tables	2 ½ M
	3.	Calculation of result	2 ½ M
	4.	Result	2 ½ M
II		Organic function group reactions	
		Any four functional groups	2 1/2x4=10M
		Total	**20M**