CHEMISTRY
(Minor)
(5th Semester)
Course No.: **CHM-DSM-302**
(Fundamental of Chemistry-III)

Contact Hours: 45; Credits: 03
Full Marks = 100[End Semester Exam (70) Internal Assessment (30)]
Pass Marks = 40 [End Semester Exam (28) Internal Assessment (12)]

UNIT-I: Transition Series Elements (3d series)

General group trends with special reference to electronic configuration, variable valency, colour, magnetic and catalytic properties, ability to form complexes and stability of various oxidation states (Latimer diagrams) for Mn, Fe and Cu.
Lanthanoids and actinoids: Electronic configurations, oxidation states, colour, magnetic properties, lanthanide contraction, separation of lanthanides (ion exchange method only).

Unit II: Chemical Kinetics

The concept of reaction rates. Effect of temperature, pressure, catalyst and other factors on reaction rates. Order and molecularity of a reaction. Derivation of integrated rate equations for zero, first and second order reactions. Half–life of a reaction. General methods for determination of order of a reaction. Concept of activation energy and its calculation from Arrhenius equation.

Theories of Reaction Rates: Collision theory and Activated Complex theory of bimolecular reactions. Comparison of the two theories (qualitative treatment only).

Unit III: Equilibria

Chemical Equilibrium: Free energy change in a chemical reaction. Thermodynamic derivation of the law of chemical equilibrium. Distinction between ΔG and ΔG^0, Le Chatelier's principle. Relationships between *Kp*, *Kc* and *Kx* for reactions involving ideal gases.

Ionic Equilibria: Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect. Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions. Solubility and solubility product of sparingly soluble salts – applications of solubility product principle.

UNIT-IV: Alcohols and Phenols

Alcohols: Preparation: Preparation of 1^o, 2^o and 3^o alcohols: using Grignard reagent, Ester hydrolysis, Reduction of aldehydes, ketones, carboxylic acid and esters. Reactions: With sodium,

HX (Lucas test), esterification, oxidation (with PCC, *alk*. $KMnO_4$, acidic dichromate, conc. HNO_3). Diols: (Up to 6 Carbons) oxidation of diols. Pinacol-Pinacolone rearrangement.
Phenols: (Phenol case): Preparation: Cumene hydroperoxide method, from diazonium salts. Reactions: Electrophilic substitution: Nitration, halogenation and sulphonation. Reimer-Tiemann Reaction, Schotten – Baumann Reaction.

UNIT-V: Aldehydes, Ketones & Carboxylic acids

Formaldehyde, acetaldehyde, acetone and benzaldehyde: Preparation: from acid chlorides and from nitriles. *Reactions:* Reaction with HCN, ROH, $NaHSO_3$, NH_2-G derivatives. Iodoform test, Aldol Condensation, Cannizzaro's Reaction, Wittig Reaction, Benzoin Condensation. Clemensen Reduction, Wolff Kishner Reduction, Meerwein-Pondorff Verley Reduction.

Carboxylic acids (aliphatic and aromatic): Preparation: Acidic and Alkaline hydrolysis of esters. Reactions: Hell – Vohlard - Zelinsky Reaction.

Reference Books:

- Puri, Sharma, Kalia; Principles of Inorganic Chemistry, Vishal Publishing Co.
- Puri, Sharma, Pathaniaa; Principles of Physical Chemistry, Vishal Publishing Co.
- Arun Bahl and B. S. Bahl: Advanced Organic Chemistry, S. Chand.
- Ghosh, Sachin Kumar; Advanced General Organic Chemistry: A Modern Approach (vol 1 & 2), NCBA
- Jain, M. K., Sharma, S. C.; Modern Organic Chemistry; Vishal Publishing Co.