B.Sc. IIIrd Semester-Industrial Chemistry

Course No: **DSC-6C**

Course Weightage: 04 Credit

Unit-I: Processes in Organic Chemicals Manufacture-I (16 Contact hours)

Halogenation: Kinetics of halogenation reactions, Reagents for halogenations. Halogenation of aromatics – side chain and nuclear halogenations.

Commercial manufactures:- Chlorobenzenes, Chloral, monochloroacetic acid, dichloromethane and dichlorofluoromethane.

Sulphonation: Sulphonating agents, Factors affecting sulphonation, Kinetics and mechanism of sulphonation reactions. Commercial sulphonation of benzene, naphthalene and alkyl benzene. Batch Vs continuous sulphonation.

Oxidation: Types of oxidation reactions and oxidizing agents. Commercial manufacture of benzoic acid, Phthalic anhydride, acetaldehyde and acetic acid.

Unit II: Processes in Organic Chemicals Manufacture –II:(16 Contact hours)

Hydrogenation: Catalysts for hydrogenation reactions and hydrogenation of vegetable oil. Manufacture of methanol from CO and H_2, hydrogenation of acids and esters to alcohols.

Alkylation: Types of alkylation and alkylating agents. Thermodynamics and mechanism of alkylation reactions. Manufacture of alkyl benzens (ethyl benzene)

Nitration: Nitration agents, kinetics and mechanism.

Nitration processes: Parafinic hydrocarbons, benzene to nitrobenzene and m-dinitrobenzene, chlorobenzene to o- and p- nitrobenzenes. Continuous Vs batch nitration.

Esterfication: Esterfication of organic acids by the addition of unsaturated compounds, esterfication of Carboxy acid derivatives. Commercial manufacture of ethyl, vinyl and cellulose acetates.

Amination;

By reduction: Methods of reduction, metal and acid, Catalytic sulphide, electrolytic, metal and alkali sulphites , metal hydrides and sodium metal.

Commercial manufacture of aniline, m-nitroaniline and p-aminophenol.

By aminolysis: Aminating agents and the factors affecting the process.

Hydrolysis: Hydrolysis agents, Mechanism and Kinetics of hydrolysis.

Unit III: Surface Chemistry, Interfacial Phenomena and Catalysis

Adsorption isotherm, preparation, types and applications of Sols, Gels, Emulsions, Micro-emulsions, Micelles and Aerosols. Effect of Surfactants, Hydrotropes.

Catalysis: Types, Basic principles, mechanisms and factors affecting the performance.

Introduction to phase transfer catalysis,

Enzyme Catalysed reactions and industrially important reactions.

Unit IV: Industrial Chemical Analysis (14 Contact hours)

Sampling procedure, sampling of bulk materials, techniques of sampling solids, liquids and gases. Collecting and processing data.

Titrimetric Analysis:- Theoretical considerations, standard solutions, primary and secondary standards, indicators and their choice in neutralization reactions. Complexometric titrations and metal-ion indicators.

Limitations of analytical methods:- accuracy, precision, errors and their types. Significant figures.

Chromatography:- Principles, working and applications of paper, TLC and Column Chromatography.

Particle size determination, rheological properties of liquids, plastics and their analysis.

Books Recommended :

1. *Unit Process in organic synthesis, Groggins, P.M. ; Mc Graw Hill Book Co.*
2. *Chemical process principles (Part -I), Hougen, K.M. and Watson, R.A., Ragatz Asia publishing House, Bombay.*
3. *Elementary principles of chemical processes, Rousseau, R.W. & Felder R.M.; Wiley publishers, N. Delhi*
4. *Handbook of Industrial Chemistry, Kent, J.A.; CBS publishers, N. Delhi*
5. *Analytical Chemistry; Christian, G.D. , 6th ed. ; Wiley; 2010*
6. *Essentials of Physical Chemistry, Kapoor, K.L. ; Vol. 3rd & 4th ; 2nd ed.; Macmillan India Ltd.; 2005*

5

B.Sc. IIIrd Semester-Industrial Chemistry

Course No: DSC-6C (Lab)

Course Weightage: 02 Credit

Section A:

1. To purify the organic compounds through crystallization process
2. To prepare and recrystalize the methyl orange and report the yield and calculate the % error
3. To prepare acetanilide from aniline
4. To prepare p-Bromoacetanilide
5. To prepare 2,4,6 – Tribromoaniline
6. To prepare 2,4,6 – Tribromo phenol
7. To convert hydrocarbon in Carboxylic acid through oxidation process
8. To prepare picric acid through sulphonation and nitration process
9. To convert nitro-compounds into amino compounds through reduction process
10. To convert hydroquinone into acetylated form

Section B:

11. To study the affect of additives on viscosity of a liquid (Ethanol-water; water-sucrose)
12. To compare cleansing power of two samples of detergents
13. To study the variation of viscosity of a liquid with temperature
    a) Ethylacetate, Methyl acetate
    b) Ethanol, Methanol, Toluene
14. Determination of molecular weight of a non-volatile solute by depression of freezing point using benzene as solvent (Napthalene , Benzamide)
15. Determination of molecular weight of a non-volatile solute by elevation of boiling point using water as solvent (urea, glucose, sucrose)

Books Recommended:

1. Practical organic chemistry; Mann, F.G. and Saunders, B.C. ; Orient-Longman, 1960.
2. Textbook of practical organic chemistry, Vogel, A.I.; Tatchell, A.R. & Furnis, B.S; Hannaford, A.J. & Smith, P.W.G. ; 5th ed. Prentice Hall ; 1996
3. Practical physical chemistry; Khosla, B.B. ; Garg, V.C. & Gulati , A.R. ; S. Chand & Co. ; 2011
4. Advanced practical physical chemistry Yadav , J.B. 20th ed.; Goel publishing house; 2001