Metal storage and transport – ferritin, transferrin and ceruloplasmin. Electron transfer proteins-cytochromes, iron-sulphur proteins. Metalloproteins as enzymes – carboxy peptidase, carbonic anhydrase, alcohol dehydrogenase, catalases, peroxidases, cytochrome P 450, superoxide dismutase, copper oxidases, vitamin B12 coenzyme.

UNIT – III **[15 HOURS]**

Therapeutic uses of Metals - Metals in medicine: Metals and human biochemistry, general requirements. Disease due to metal deficiency and treatment: Iron, zinc, copper, sodium, potassium, magnesium, calcium and selenium.

Metal complexes as drugs and therapeutic agents: Antibacterial agents, antiviral agents, metal complexes in cancer therapy, metal complexes for the treatment of rheumatoid arthritis, vanadium in diabetes, metal complexes as radio diagnostic agents.

Treatment of toxicity due to inorganics: General aspects of mechanism of metal ion toxicity, (i)

Mechanism of antidote complex with poison, rendering it inert: arsenic, lead, mercury, iron, copper (ii) Antidote accelerated metabolic conversion of poison to non-toxic product: cyanide and carbon monoxide

REFERENCES

1. M.N.Hughes: Inorganic Chemistry of Biological Processes, (2nd edn.) Wiley, 1988.
2. I.Bertini. H.B.Gray, S.J.Lippard and J.S.Valentine: Bioinorganic Chemistry, Viva Books, 1998.
3. J.E Huheey, R.L.Keiter and A.L.Keiter: Inorganic Chemistry(4th edn),Addison Wesley, 2000.
4. K. Hussain Reddy, Bioinorganic Chemistry - New Age International Ltd. (2003).
5. R.W. Hay, Bioinorganic Chemistry - Ellis Horwood Ltd., (1984)
6. Asim K Das, Bioinorganic chemistry, Books & Allied (P) Ltd.

CH H 552: ORGANIC SYNTHETIC METHODS

COURSE OUTCOME:

Enable the students:

- To acquire knowledge on the various reagents employed for oxidation and reduction of various kinds of organic molecules.
- To understand the various methods of halogenations of carbonyl compounds, benzylic and allylic halogenations.
- To understand the synthetic design with diverse chemical reactions, planning of organic synthesis and functionality.
- To learn the principles and technologies used in disconnection approach, the utility of protecting group strategy in organic synthesis and retrosynthetic analysis.

UNIT–I: **[15 Hours]**

Reduction Reactions: Catalytic hydrogenation-Introduction, catalysts and solvents, mechanisms and stereochemistry of catalytic hydrogenations. Hydrogenolysis and homogeneous catalytic hydrogenation.

Metal hydride reduction: Reduction with LiAlH4and NaBH4, Stereo chemistry of reduction, Reduction with diborane and related reactions.

Dissolving Metal Reductions: Mechanisms of reduction of carbonyl compounds, Bimolecular reductions of esters, Birch reduction, Wolf-Kishner reduction and reduction with diimide.

Oxidation reactions: Mechanism of oxidation reaction with chromium and manganese salts, Osmium tetroxide, peracids, periodic acid and Lead tetra acetate.

Halogenation: Halogenation of carbonyl compounds. Benzyllic and Allylic halogenations.

UNIT- II: **[15 Hours]**

Synthetic Design: Carbon skeleton frame work, Classification of carbon-carbon single bond and double bond forming reaction and their use in carbon skeleton ring formation. Ring forming and ring cleaving reactions, use of Thorpe condensation, Carbene insertion reaction, Friedel-Crafts reaction, 1,3-dipolar addition and Ene reaction in ring formation, Oxidative cleavage of rings and Retro Diel's-Alder reactions.

Planning of Organic Synthesis: Selection of starting materials and key intermediates during the synthesis. Synthesis of Cubane and Iswarane. Use of Robinson annulation, Dieckmann cyclisation, Arndt-Eistert synthesis, Diel's- Alder reaction in organic synthesis.

Functionality: Synthesis of 6- and 7- methoxy tetralones, biotin and penicillin-V with special reference to the introduction of functional groups. Stereo chemical consideration and stereo selectivity during organic synthesis.

UNIT- III: **[15 Hours]**

General introduction to disconnection approach. Basic principles and technologies used in disconnection approach. Synthons and synthetic equivalents. Interconversion of functional groups. One group C-X and two group C-X disconnections. Use of C-C one group and C-C two group disconnections in the synthesis of 1,2; 1,3; 1,4; 1,5 and 1,6-difunctionalised compounds. **Protecting groups:** Principle of protection of hydroxyl, amino, carboxylic and carbonyl groups.

Retrosynthetic analysis: Analysis of alcohols, carbonyl compounds cyclic and acyclic alkanes, benzocaine, p-methoxyacetophenone, acetonecyanohydrin, 2-methyl-6-methoxy-indole-3-acetic acid, 6-methylquinoline & 1-phenyl-4-p-methoxyphenyl-1,3-butadiene. Illustrative synthesis of Limonene, Danishefsky's pentalenolactone, Benziodarone, Nitrofurazone, Warfarin, Juvabione, Longifolene, Prelog-Djerassi lactone and Taxol.Solid phase synthesis of oligonucleotides.

REFERENCES:

1. Modern Organic Reactions- H.O.House.
2. Organic Synthesis- R. E. Ireland (Prentice Hall India), 1969.
3. Art in Organic Synthesis- Anand, Bindra & Ranganath-(Wiley New Delhi), 1970.
4. Organic Synthesis a Disconnection Approach- Stuart Warren
5. Advanced Organic Chemistry-IV-Ed. Part A &B-F.J.Carrey & R.J.Sundberg (Kluwer) 2001.
6. Modern Methods of Organic Synthesis-N.Carruthers (Cambridge University), 1996.
7. Selected Organic Synthesis-Ian Fleming (John Wiley & Sons) 1973.

CH H 553: ELECTROCHEMISTRY AND REACTION DYNAMICS

COURSE OUTCOME:

- It is an advanced course on two different topics, electrochemical processes and theoretical aspects of chemical kinetics. The first part deals with concept and applications of electrocatalysis and processes taking place at the electrode and the solution interface.
- This course content trains students on alternate methods of synthesis using electrochemical concepts.
- Introduces the student to theoretical basis of understanding the rates of complex reactions,
- Arriving at the mechanism of various inorganic and organic reactions and knowledge of advanced techniques with the use of lasers in characterizing intermediates complex chemical reactions.