

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, (2<sup>nd</sup> 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(4<sup>th</sup> 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  $\text{LiAlH}_4$  and  $\text{NaBH}_4$ , 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. Benzylic 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.



Mangalore University  
Mangalagangothri - 574 199



Department of Studies in Chemistry  
Organises  
International Webinar



on  
Recent Advances in Organic Synthetic Methods (RAOSM 2021)  
August 27 & 28, 2021

Chief Guests

Resource Persons



Chief Guest-Inauguration  
Dr. B. Ravichandran  
ROHC, ICMR, Bengaluru



Chief Guest-Valedictory  
Dr. Shridhara K.  
ArkGen Pharma Pvt. Ltd., Bengaluru



Prof. I. N. N. Namboothiri  
IIT Bombay, India



Prof. S. K. Awasthi  
University of Delhi, India



Prof. Bhisma K. Patel  
IIT Guwahati, India



Prof. A. S. Achal Kumar  
IIT Guwahati, India



Prof. Nonappa  
Temper University, Finland



Prof. Akshai Kumar  
IIT Guwahati, India

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**Department of Studies in Chemistry**  
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*International Webinar*  
on  
**Recent Advances in Organic Synthetic Methods (RAOSM 2021)**  
August 27 & 28, 2021

**Program Schedule**

**Friday, 27-08-2021**

- 10.00am-11.00am Inauguration
- 11.15am-12.15pm **Lecture 1: Prof. Irishi N. N. Namboothiri, IIT Bombay, India**  
*Role of Bestmann-Ohira Reagent and its Sulfone and Ester Analogues as Michael Donors and 1,3-Dipolar Precursors*
- 02.00pm-03.00pm **Lecture 2: Prof. Bhisma K. Patel, IIT Guwahati, India**  
*Intermolecular Amination of Remote and Proximal Unactivated C<sub>sp<sup>3</sup></sub>-H Bonds Through Intrinsic Substrate Reactivity – Expanding towards a Traceless Directing Group Approach*
- 03.15pm-04.15pm **Lecture 3: Prof. Nonappa, Tempere University, Finland**  
*Plant Triterpenoid-Based Building Blocks for Functional Organic Nanomaterials*

**Saturday, 28-08-2021**

- 10.00am-11.00am **Lecture 4: Prof. S. K. Awasthi, University of Delhi, India**  
*Design, Synthesis and Antimalarial Activity of Tetraoxane Analogs*
- 11.15am-12.15pm **Lecture 5: Prof. A. S. Achal Kumar, IIT Guwahati, India**  
*Self-assembled Nanostructured Organic Semiconductors*
- 02.00pm-03.00pm **Lecture 6: Prof. Akshai Kumar A. S., IIT Guwahati, India**  
*Poly-Fluorinated Poly-Aromatic Hydrocarbons and Their Versatile Applications*
- 03.15pm-04.15pm Valedictory



**Department of Studies in Chemistry**

**International Webinar on  
Recent Advances in Organic Synthetic Methods (RAOSM 2021)**



The image displays two promotional posters for the RAOSM 2021 webinar. The left poster is an organizational chart listing the following:

- Chief Guests:** Dr. B. Ravichandran (ROHC, ICMR Bengaluru), Prof. I. N. N. Namboothiri (IIT Bombay, India), Prof. Bhisma K. Patel (IIT Guwahati, India), Prof. Nonappa (Tempere University, Finland), Dr. Shridhara K. Achal (Rajawade Pk. Rd., Bengaluru), Prof. S. K. Awasthi (University of Delhi, India), Prof. A. S. Achal Kumar (IIT Guwahati, India), Prof. Akshai Kumar (IIT Guwahati, India).
- Resource Persons:** Prof. P. S. Yadapadithaya (Hon'ble Vice Chancellor), Prof. Boja Poojary (Coordinator), Prof. Jagadeesh Prasad D. (Chairman), Prof. Kishore Kumar C. K. (Registrar), Prof. Balakrishna Kalluraya, Prof. B. Narayana, Prof. B. Vishalakshi, Dr. M. R. Maddani.
- Patron:** Prof. P. S. Yadapadithaya, Hon'ble Vice Chancellor.
- Organizing Committee:** Prof. Balakrishna Kalluraya, Prof. B. Narayana, Prof. B. Vishalakshi, Dr. M. R. Maddani.

The right poster is the **Program Schedule** for Friday, 27-08-2021 and Saturday, 28-08-2021:

- Friday, 27-08-2021:**
  - 10.00am-11.00am: Inauguration
  - 11.15am-12.15pm: Lecture 1: Prof. Irishi N. N. Namboothiri, IIT Bombay, India. *Role of Bestmann-Ohira Reagent and its Sulfone and Ester Analogues as Michael Donors and 1,3-Dipolar Precursors*
  - 02.00pm-03.00pm: Lecture 2: Prof. Bhisma K. Patel, IIT Guwahati, India. *Intermolecular Amination of Remote and Proximal Unactivated C<sub>sp</sub><sup>3</sup>-H Bonds Through Intrinsic Substrate Reactivity – Expanding towards a Traceless Directing Group Approach*
  - 03.15pm-04.15pm: Lecture 3: Prof. Nonappa, Tempere University, Finland. *Plant Triterpenoid-Based Building Blocks for Functional Organic Nanomaterials*
- Saturday, 28-08-2021:**
  - 10.00am-11.00am: Lecture 4: Prof. S. K. Awasthi, University of Delhi, India. *Design, Synthesis and Antimalarial Activity of Tetraoxane Analogs*
  - 11.15am-12.15pm: Lecture 5: Prof. A. S. Achal Kumar, IIT Guwahati, India. *Self-assembled Nanostructured Organic Semiconductors*
  - 02.00pm-03.00pm: Lecture 6: Prof. Akshai Kumar A. S., IIT Guwahati, India. *Poly-Fluorinated Poly-Aromatic Hydrocarbons and Their Versatile Applications*
  - 03.15pm-04.15pm: Valedictory

Department of Studies in Chemistry, Mangalore University organised an international webinar on Recent Advances in Organic Synthetic Methods (RAOSM 2021) during August 27<sup>th</sup> - 28<sup>th</sup> 2021.

Eminent Professors from various institutions across India and abroad were invited as resource speakers to deliver the lectures. Dr. B. Ravichandran, ROHC, ICMR Bengaluru was our guest of honor for the inauguration function. Prof. P. S. Yadapadithaya presided over the Inauguration function on 27<sup>th</sup> August 2021. After the Inauguration, Prof. Irishi N. N. Namboothiri, IIT Bombay delivered the first lecture on 'Role of Bestmann-Ohira Reagent and its Sulfone and Ester Analogues as Michael Donors and 1,3-Dipolar Precursors'. The 2<sup>nd</sup> lecture of the Day 1 was delivered by Prof. Bhisma K. Patel, IIT Guwahati on 'Intermolecular Amination of Remote and Proximal Unactivated C<sub>sp</sub><sup>3</sup>-H Bonds Through Intrinsic Substrate Reactivity – Expanding towards a Traceless Directing Group Approach'. Prof. Nonappa, Tempere University, Finland gave last lecture of Day 1 on Plant Triterpenoid-Based Building Blocks for Functional Organic Nanomaterials.

On Day 2, Prof. S. K. Awasthi, University of Delhi, presented the 1<sup>st</sup> lecture on 'Design, Synthesis and Antimalarial Activity of Tetraoxane Analogs'. Similarly, Prof. A. S. Achal Kumar, IIT Guwahati, delivered the 2<sup>nd</sup> lecture on Self-assembled Nanostructured Organic Semiconductors. The last lecture of the webinar was presented by Prof. Akshai Kumar A. S., IIT Guwahati, on Poly-Fluorinated Poly-Aromatic Hydrocarbons and Their Versatile Applications'.

Faculties of various institutions, MSc students, Guest faculties and other invitees participated in the webinar. Overall around 250 participants benefited from this webinar

on various organic synthetic methods. Resource persons spoke on their recent research works related to advanced organic synthetic methods for the synthesis of biologically and medicinally important molecules. Many of the participants interacted with resource persons after their presentations. After all the lectures, valedictory function was conducted. Prof. Kishore Kumar C. K. Registrar, Mangalore University presided over this valedictory function. Dr. Sridhara K., ArkGen Pharma Pvt. Ltd., Bengaluru was our guest of honor.

