Department of Chemical Sciences

Graduate Course on

Advanced Inorganic and Bio-inorganic Chemistry

Course Content

I. The basics: An introduction to coordination chemistry of metals in biology
1. Coordination Chemistry, 2. Biomolecular ligands (to metals), 3. Metal ion binding motifs, 4. Structure of bio-molecules and effects of metal ion association

II. Survey of some important metal ions in Biology

A. Sodium, Potassium and Calcium: mobile metal ions from the s-block, Calmodulin in cell-signaling pathways, P-type ATPases

B. Zinc: Lewis acidity: Carboxypeptidase A , Carbonic anhydrase

C. Iron, copper and manganese: Redox properties
Ferritin and transferrin, metallothionines, siderophore
1. Heme iron and heme proteins: Oxygen and Electron transfer processes by heme proteins, Cytochrome P-450, Cytochrome c oxidase, Peroxidases
2. Iron-sulfur clusters
3. Blue copper centers in electron transport
4. Non-heme iron, manganese and copper as catalysts of redox reactions: Methane monooxygenase, Superoxide dismutase

D. Cobalt: participant in organometallic chemistry: Methionine Synthase

E. Molybdenum: Sulfite Oxidase and xanthine oxidase, nitrogenase

F. Chemistry of main group elements: low-valent and low-coordination systems

G: Metals in medicine and imaging: Metal Based Therapeutic Agents, Metal Based Diagnostic Tools, Biological Targets for Metal Based Therapies

III. Physical Methods used in Bioinorganic Chemistry
1. Electronic, vibrational and Raman spectroscopy
2. Bio-electrochemistry
3. NMR and EPR techniques
4. CD and MCD techniques
5. Time resolved methods
6. X-ray diffraction and EXAFS
7. Imaging Techniques

IV. Recent developments in Bioinorganic Chemistry

Mode of Evaluation: Attendance, assignments, project proposal and two examinations.

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Venue: **Lecture room AG80**
Days: **Tuesdays, Thursdays and Fridays**
Time: **9:30 hr to 11:00 hr (Tuesdays and Fridays), 11:30 hr to 13:00 hr (Thursdays)**

The first lecture starts on January 31, 2017.