**SEM-III (autonomous)**

CHE-III E-4 **Bioinorganic Chemistry**

**Faculty:** Dr. Lactina Gonsalves and Dr. Rohan Kunkalekar (22 + 23 lectures)

**Time:** Thursday: 11.00-12.00

 Friday: 12.00-1.00 (alternate lecture)

**Location:** D-103

**Lecture Schedule:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Lec. No.** | **Topic** | **Synopsis** | **Ref.** | **Remark** |
| 1. | Iron and Copper containing compounds in biology | Introduction | 1,3 | Refer to the pdf and video on g-classroom |
| 2. |  | Heme proteins: haemoglobin, oxygen transport and storge |   |  |
| 3. |  | Myoglobin, Bohr effect |  |  |
| 4. |  | Cytochrome c |  |  |
| 5. |  | Non heme proteins: hemerythrin, hemocyanin |  |  |
| 6. |  | Iron transport and storage: Siderophores |  |  |
| 7. |  | Transferrin and Ferritin |  |  |
| 8. |  | Electron transfer: Fe-S clusters |  |  |
| 9. |  | Fe-S cluster contd… |  |  |
| 10. |  | CA-1 (Test) |  |  |
| 11. |  | Copper proteins |  |  |
| 12 |  | Cytochromes |  |  |
| 13 |  | Copper electron transfer centres |  |  |
| 14 |  | Cu electron transfer contd… |  |  |
| 15 | Metalloenzymes | Introduction, role of enzymes in biology | 1,2,3 | Refer to the pdf on g-classroom |
| 16 |  | Copper enzymes |  |  |
| 17 |  | Zinc enzymes |  |  |
| 18 |  | CA-3 (MCQ) |  |  |
| 19 |  | Cobalt enzymes |  |  |
| 20 |  | Molybdenum enzymes |  |  |
| 21 |  | Vit B12 and B12 coenzymes |  |  |
| 22 |  | Tutorial and Feedback |  |  |

**REFERENCE BOOKS:**

1. Shriver and Atkins, Inorganic Chemistry, 5th Edition, Oxford University Press.
2. I. Bertini, H. B. Gray, S. J. Lippard and J. S. Valentine, *Bioinorganic Chemistry*, University Science Books (1994).
3. J. J. R. Fausto da Siliva and R. J. P. Williams, The Biological Chemistry of the Elements, Oxford University Press (1991)
4. D. E. Fenton, Bio coordination Chemistry, Oxford Chemistry Printers, Oxford University Press (1995)

**SEM-IV (autonomous)**

CHE-IV E-7 **Spectroscopic Techniques**

**Faculty:** Dr. Lactina Gonsalves and Dr. Rohan Kunkalekar (23 + 22 lectures)

**Time:** Thursday: 11.00-12.00

 Friday: 12.00-1.00 (alternate lecture)

**Location:** D-103

**Lecture Schedule:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Lec. No.** | **Topic** | **Synopsis** | **Ref.** | **Remark** |
| 1. | General Introduction | Overview of spectroscopy, Electromagnetic radiation | 1,3 | Refer pdf and e-book on g-classroom |
| 2. |  | Interaction of electromagnetic radiation with matter, wave properties, particle properties, EMR spectrum |  |  |
| 3. |  | Problems based on EMR spectrum |  | Practice problems on g-classroom |
| 4. |  | Atomic and molecular spectra, representation of spectra |  |  |
| 5. |  | Photons as signal source, basic components of spectroscopic instruments. |  |  |
| 6. |  | Sources of energy, sources of EMR radiation, sources of thermal energy, chemical sources |  |  |
| 7. |  | Wavelength selection, filters |  |  |
| 8. |  | Monochromators |  |  |
| 9. |  | interferometers |  |  |
| 10. |  | Detectors |  |  |
| 11. |  | CA-1 (MCQ) |  |  |
| 12 |  | Photon transducers |  |  |
| 13 |  | Thermal transducers |  |  |
| 14 |  | Signal processors, solvents used for spectrophotometry, spectrometric error in measurement. |  |  |
| 15 |  | Origins of atomic spectra, production of atoms and ions |  |  |
| 16 | Atomic Spectroscopy | Atomic Emission Spectrometry: Introduction, Principle | 1,3 |  |
| 17 |  | AES: Instrumentation, applications, advantages and limitations |  |  |
| 18 |  | Atomic Absorption Spectrometry: Introduction, principle |  |  |
| 19 |  | CA-3 (test) |  |  |
| 20 |  | Instrumentation, applications, advantages and limitations |  |  |
| 21 |  | Atomic Fluorescence Spectrometry: Introduction, principle |  |  |
| 22 |  | Instrumentation, application |  |  |
| 23 |  | Revision/Tutorial |  |  |

**TEXT BOOK:**

1. Skoog, D. A., West, D. M., Holler F. J., Crouch, S. R., Fundamentals of Analytical Chemistry, 8th Ed

**REFERENCE BOOKS:**

1. Holler F. J., Skoog, D. A., Crouch, S. R., Principles of Instrumental Analysis, 6th Edition,

 Thomson Books

2.Willard, H.H., Merritt, L.L., Dean, J. A., Settle, F. A., Instrumental Methods of Analysis, CBS

 Publishing New Delhi, 7th Edition.

3. Christian, G. D., Analytical Chemistry, John Wiley, 5th Edition

4. Ewing, G.W., Instrumental Methods of Chemical Analysis, 5th Edition, Mc-Graw Hill

 International Edition.

**SEM-V (autonomous)**

CHE-V E-10 **Nanomaterial and Solid State Chemistry**

**Faculty:** Dr. Lactina Gonsalves and Dr. G. K. Naik (22 + 23 lectures)

**Time:** Tuesday 11.00-12.00

 Friday 11.00-12.00 (alternate lecture)

**Location:** C-101

**Lecture Schedule:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Lec. No.** | **Topic** | **Synopsis** | **Ref.** | **Remark** |
| 1. | Introduction and properties of nanomaterials | Introduction, fundamentals, terminology, history | 3,5 | Refer to the pdfs, video uploaded on g-classroom |
| 2. |  | Classification of nanomaterials, properties of nanomaterials  |  |  |
| 3. |  | Optical properties |  |  |
| 4. |  | Magnetic properties |  |  |
| 5. |  | Surface area, catalytic properties |  |  |
| 6. |  | Mechanical Properties |  |  |
| 7. |  | **CA-1 (Test)** |  |  |
| 8. | Synthesis and Characterisation of nanomaterials | Chemical Methods: precursor, precipitation method | 3,5 | Refer to the pdfs, video uploaded on g-classroom |
| 9. |  | Sol-gel, hydrothermal method |  |  |
| 10. |  | Sonochemical method |  |  |
| 11. |  | Microwave method |  |  |
| 12 |  | Physical Methods: PVD |  |  |
| 13 |  | Chemical Vapour deposition (CVD) |  |  |
| 14 |  | Mechanical methods |  |  |
| 15 |  | Biological methods |  |  |
| 16 |  | Characterisation Methods: SEM, TEM |  |  |
| 17 |  | X-Ray Diffraction Studies |  |  |
| 18 |  | Miller indices, Problems based on XRD |  |  |
| 19 |  | BET surface area |  |  |
| 20 | Applications of Nanomaterials | Applications in energy, sports, textile, cosmetics, medicine, defence security, catalysis | 1 | Refer to the pdfs, video uploaded on g-classroom |
| 21 |  | Toxicity of nanomaterials |  |  |
| 22 |  | Revision/Tutorial, Feedback |  |  |

**REFERENCE BOOKS:**

TEXTBOOK:

1. Atkins P, Overton T, Rourke J et.al, Shriver and Atkins’ Inorganic Chemistry, 5th Edition, Oxford University Press.

ADDITIONAL READING:

1. Keer H. V., *Principles of Solid State Chemistry*, New Age International Publishers,

2. Kulkarni S. K., *Nanochemistry, Principles and Practices*, Capital publishers.

3. Poole C. P. and Owens F. J., *Introduction to Nanotechnology*, John-Wiley and Sons.

4. Rao M. B. and Reddy K. K., *Introduction to Nanotechnology*, Campus books International.

5. West A. R., *Solid State Chemistry and its Applications*, John-Wiley and Sons.

**SEM-V (autonomous)**

CHE-V E-11 **Organometallic Chemistry**

**Faculty:** Dr. Lactina Gonsalves and Dr. Roopa Belurkar (23 + 22 lectures)

**Time:** Monday 11.00-12.00

 Saturday 12.00-1.00 (alternate lecture)

**Location:** C-101

**Lecture Schedule:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Lec. No.** | **Topic** | **Synopsis** | **Ref.** | **Remark** |
| 1. | Introduction to organometallic chemistry | Introduction, 18 e- rule, EAN concept | 1,2 | Practice problems on g-classroom |
| 2. |  | Electron counting and oxidation states of in organometallic complexes |  |  |
| 3. |  | Problem solving |  |  |
| 4. |  | Problem solving |  |  |
| 5. |  | General method of Preparation, Properties and Reactions  |  |  |
| 6. |  | CA-1 (MCQ) |  |  |
| 7. | Metallocenes | Sandwich compounds, Ferrocene: synthesis, structure, properties | 1,2 |  |
| 8. |  | Structure and aromaticity in metallocenes,  |  |  |
| 9. |  | Synthesis and reactivity od cyclopentadienyl compounds |  |  |
| 10. |  | Fluxional behaviour in metallocenes |  |  |
| 11. |  | Metal-Metal bonding and metal clusters. Structure of clusters |  |  |
| 12 |  | Electron counting in metal clusters |  |  |
| 13 |  | Problem solving |  |  |
| 14 |  | Problem solving |  |  |
| 15 |  | CA-2 (TEST) |  |  |
| 16 | Reactivity of organometallic compounds | Reactions of organometallic compounds.i) Ligand substitution | 1,2 | Practice problems on g-classroom |
| 17 |  | ii) Oxidative addition |  |  |
| 18 |  | iii) Reductive elimination iv) sigma-bond methathesis |  |  |
| 19 |  | iv)1,1 migratory insertions, 1-2 insertions v) beta- hydride elimination |  |  |
| 20 |  | Catalysis by organometallic compounds; alkene hydrogenation |  |  |
| 21 |  | Hydroformylation |  |  |
| 22 |  | Reaction with Ziegler-natta catalyst |  |  |
| 23 |  | Problem solving/tutorial and Feedback |  |  |
|  |  |  |  |  |

**REFERENCE BOOKS:**

TEXTBOOK:

1. Atkins P, Overton T, Rourke J et.al, Shriver and Atkins’ Inorganic Chemistry, 5th Edition, Oxford University Press.

ADDITIONAL READING:

1. Cotton F.A and Wilkinson G, Basic Inorganic Chemistry,Wiley Eastern Ltd.

2. Huheey J.E, Keiter E.A, Keiter R.L, Medhi O.K, Inorganic Chemistry: Principles of

Structure and Reactivity, Pearson Edu.

3. Lee J.D, Concise Inorganic Chemistry, Wiley-India

**SEM-VI (autonomous)**

CHE-VI E-15 **Selected Topics in Inorganic Chemistry**

**Faculty:** Dr. Lactina Gonsalves and Dr. Roopa Belurkar (23 + 22 lectures)

**Time:** Monday 10.30-11.30

 Saturday 11.30-12.30 (alternate lecture)

**Location:** C-101

**Lecture Schedule:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Lec. No.** | **Topic** | **Synopsis** | **Ref.** | **Remark** |
| 1. | Thermodynamic and Kinetic Aspects of Metal Complexes | Thermodynanic and kinetic stability of metal complexes | 1,2,4 | Refer to pdf on g-classroom |
| 2. |  | Equilibrium constants, formation constants, inert and labile complexes |  |  |
| 3. |  | Predictions based on Taubes classification |  |  |
| 4. |  | Factors affecting stability |  |  |
| 5. |  | Factors affecting stability (contd) |  |  |
| 6. |  | Substitution reactions in tetrahedral and octahedral complexes |  |  |
| 7. |  | SN1 and SN2 mechanism |  |  |
| 8. |  | Base hydrolysis, annation reactions |  |  |
| 9. |  | Factors to predict the mechanism of reaction |  |  |
| 10. |  | Electron transfer reactions, inner sphere and outer sphere mechanism |  |  |
| 11. |  | Trans effect |  |  |
| 12 |  | CA-1 (Test) |  |  |
| 13 | Materials Chemistry | Zeolites: types structure | 1,2,4 | Refer to pdfs and video on g-classroom |
| 14 |  | Applications of zeolites |  |  |
| 15 |  | Metal organic Frameworks: structure and properties, applicatins |  |  |
| 16 |  | Molecular materials: Fullerides |  |  |
| 17 |  | Liquid crystals |  |  |
| 18 |  | Superconductors: discovery, types, Meissner effect, critical temp. |  |  |
| 19 |  | Corrosion: theory |  |  |
| 20 |  | CA-2 (Test) |  |  |
| 21 |  | Galvanic corrosion and other forms |  |  |
| 22 |  | Prevention methods |  |  |
| 23 |  | Revision/Tutorial, Feedback |  |  |
|  |  |  |  |  |

**REFERENCE BOOKS:**

TEXTBOOK:

1. Atkins P, Overton T, Rourke J et.al, Shriver and Atkins’ Inorganic Chemistry, 5th Edition, Oxford University Press.

ADDITIONAL READING:

1. Lee J.D, *Concise Inorganic Chemistry*, Wiley-India

2*.* Huheey J.E, Keiter E.A, Keiter R.L, Medhi O.K, *Inorganic Chemistry: Principles of*

 *structure and reactivity*, Pearson Edu., 1993

3. Cotton F.A and Wilkinson G, *Basic Inorganic Chemistry*,Wiley Eastern Ltd, 1993

4. Puri B.R, Sharma L.R, Kale K.C, *Principles of Inorganic Chemistry*, Vallabh Publications.