BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI- HYDERABAD CAMPUS

**FIRST SEMESTER 2021-22**

**Course Handout (PART II)**

20/08/2021

In addition to part I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

***Course No.* : CHEMF214**

***Course Title*: Inorganic Chemistry I**

***Instructor‑in‑charge* :**  Prof***.*N.Rajesh**

***Instructor-(Lec and Tut*):** Prof**.N.Rajesh**

1. **Scope and objective:** This course primarily is intended to give a basic foundation to the various aspects of inorganic chemistry such as periodicity, bonding, structures of simple compounds and chemistry of some main group elements.
2. **Broad Learning outcomes**: The objective of this course is to provide a comprehensive survey in the topics detailed in the course plan with the following broad outcomes: -

* Interpret the relevance of electronegativity and other periodic properties
* Illustrate the importance of acid base chemistry and applications of Hard-soft acid base concept
* Discuss the chemistry of halogens, noble gases and their significance
* Outline the basic aspects of Solid state chemistry with real-world applications.
* Explore the basic features of silicon and phosphorous chemistry
* Recognize the importance of intercalation compounds (graphite, clays) inorganic chains, rings, cages and cluster compounds

1. **Text Book:** Huheey J. E., Keiter, Ellen A., Keiter, Richard L. Okhil K.Medhi, “

**Inorganic Chemistry**”, 4th ed., Pearson Education 2006.

**Reference Books:** I. Inorganic Chemistry by Shriver & Atkins, (4th edition), Oxford

II. Cotton F.A., Wilkinson G., Murillo, C.A., Bochmann, M. “

**Advanced Inorganic Chemistry**”, 6th ed., John Wiley and Sons, New York (2003).

1. **Course Plan:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Lecture No.*** | ***Topics to be covered*** | ***Learning Outcome*** | ***Learning Objectives*** | ***Chapter in the Text Book*** |
|  | **Concepts** | |  |  |
| 1 | Introduction Relevance of inorganic chemistry  In real life applications | | Basic course description  and discussion of handout |  |
| 2-5 | Electronegativity | Applications and relevance in understanding inorganic concepts like acidity, color, spectroscopy etc.. | Definition, scales of electronegativity | Chapter 5 |
| 6-8 | Acid base chemistry | Relevance to environmental applications | Measures of acid base strength,  Systematic acid base interactions,  Hard soft acid base(HSAB) concept-  diverse metal-ligand interactions,  symbiosis and other applications | Chapter 8 |
| 9-11 | Solvents and molten salts | Relevance in metallurgy | Chemistry of aqueous and non-aqueous solvents,  molten salts (ionic liquids) | Chapter 9 |
| 12 | Electrode potentials | Application to hydrometallurgy | Latimer diagram to calculate EMF and  Frost diagram to predict the stability of oxidation states | Chapter 9 |
|  | **Halogens/ Noble gases** | |  |  |
| 13-15 | Noble gas chemistry | Importance and applications | Early discovery of noble gases, isolation,  xenon compounds, bond strength in noble gases | Chapter 12 |
| 16-18 | Chemistry of halogens | Applications, synthetic aspects | Anomalous behavior of fluorine, Halogens oxides,  oxy fluorides, interhalogens, polyhalides,  oxy acids of halogens, halogen cations and pseudohalides | Chapter 12 |
|  | **Bonding in Solids** | |  |  |
| 19 | VSEPR theory | Understand bonding | VSEPR rules (self study)  applications to simple compounds,  atomic inversion and pseudorotation | Chapter 6 |
| 20-22 | Structures of crystal lattices | Importance of Solids in diverse applications | Lattice energy, structures of  NaCl, CsCl, TiO2, CaF2, ZnS,  Radius ratio rules, Fajans rules- covalent character | Chapter 4 |
| 23-24 | Complex solids | Significance in world of materials | Layered structures, spinels and superconductors.  Basic aspects of band theory and crystal defects | Chapter 4 |
|  | **Main group elements-I** | |  |  |
| 25-26 | Main group elements: Periodicity | Implications of main group element properties in varied applications | First and second row anomalies, diagonal relationships,  bonding in silicon and phosphorous compounds,  GroupIIIA, IVA anomalies, inert pair ,  relativistic effects and aurophilicity | Chapter 10 |
|  | **Main group elements-II** | |  |  |
| 27-30 | Inorganic chains | Importance of chain compounds in catalysis and analytical applications | Catenation, heterocatenation, silicate minerals,  intercalation chemistry, one dimensional conductors,  isopoly and heteropolyanions | Chapter 11 and chapter **13** ( **for iso and hetro polyanions**) |
| 31-34 | Inorganic rings | Diverse properties and practical applications | Borazines, phosphazenes, phosphazene polymers,  few heterocyclic and homocyclic ring systems | Chapter 11 |
| 35-37 | Inorganic cages | Relevance and utility in inorganic and organic chemistry | Boranes, carboranes, structure prediction for  heteroboranes,organometallic clusters | Chapter 11 |
| 38-40 | Inorganic clusters | Importance in interesting real world applications | Metal clusters, (di, tri and tetra and hexa nuclear clusters-  bonding in Rhenium and Molybdenum compounds,  Zintl ions, Chevrel phases and infinite metal chains | Chapter 13 |

5 **Evaluation Scheme:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **EC NO.** | **Evaluation Component** | **Duration** | **Weightage (%)** | **Date Time** | **Nature of Component** |
| 1 | Mid sem Test | 90min. | 35 | 22/10/2021 1.30 - 3.00PM | Closed book |
| \* 2. | Quiz I | 15 min | 10 |  | Open |
|  | Quiz II | 15 min | 10 |  | Open |
| \*3 | Group Discussion (GD) | 5-7 min/grp | 5 |  | Open |
| 4. | Comprehensive. Exam. | 120 min | 40 | 23/12 AN | Closed book |

\***Quiz (written) dates** will be announced prior and it would be conducted tentatively in the **first or midweek of Sep and Oct.** **GD (research article based)** is like an open book component since each group is permitted to refer the journal articles with them during discussion. **GD would be held tentatively 10 days before the end of the semester**. Students would be divided into 5-6 members per group with duration of about 5-7 min per group. Topics and formation of group is left to the students’ choice (representative topics could be suggested by instructor). **Evaluation for each member would be done based on the level of participation, ability to moderate in the right direction and knowledge of the particular topic assigned to each group.**

1. **Make‑up Policy:** Make‑up will be considered for only legitimate reasons with prior permission.
2. **Chamber Consultation hours:** To be announced in the class.
3. **Academic Honesty and Integrity Policy**: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

9. **Notices:** Relevant notices regarding the course will be displayed on CMS.

Instructor in charge

ChemF214