Fundamentals of Inorganic ChemistryCourse Code

CH-150

Credit Hours 3-1

Pre-requisite Nil

Course Objectives

1. Students will acquire knowledge about the key introductory concepts of periodic law and periodicity, chemical bonding, acid-base chemistry, and properties of p-block elements as well as using this knowledge for qualitative and quantitative analysis of inorganic compounds during laboratory work.

Text Books

2. Cotton, F. A., Wilkinson, G. and Gaus, P. L., "Basic Inorganic Chemistry", 3rd Ed., Wiley, New York, 1995.
3. Huheey, J. E., Keiter, E. A. and Keiter, R. L., "Inorganic Chemistry: Principles of Structure and Reactivity", 4th Ed., Harper and Row, New York, 2001.

Recommended Books:

4. Clyde Day, M. & Selbin, J., "Theoretical Inorganic Chemistry", 2nd Ed., Van Nustrand Reinhold, 1969.
5. Lee, J.D., "Concise Inorganic Chemistry", Chapman and Hall, 5th Ed., 1996.
6. Shriver, D. F., Atkins, P. W. and Langford, C. H., "Inorganic Chemistry", Oxford University Press, 2nd Ed., 1994.
7. Bassette, J., Denney, G. H. and Mendham, J., "Vogel's Textbook of Quantitative Inorganic Analysis Including Elementary Instrumental Analysis", English Language Book Society, 4th Ed., 1981.

Detailed Contents

8. The Periodic Law and Periodicity: Development of Periodic Table; Classification of elements based on s, p, d and f orbitals, group trends and periodic properties in s, p, d and f block elements, i.e., atomic radii, ionic radii, ionization potential, electron affinities, electronegativities and redox potential.
9. Principles of Chemical Bonding: Types of chemical bonding; Lewis structures and prediction of shapes using VSEPR model, the localized bond approach: VB theory, hybridization and resonance; the delocalized approach to bonding: molecular orbital theory as applied to diatomic and polyatomic molecules, three center bonds, bonding theory of metals and intermetallic compounds; conductors, insulators and semiconductors; bonding in electron deficient compounds; hydrogen bonding.
10. Acids and Bases: Concepts of acids and bases including SHAB concept, relative strength of acids and bases, significance of pH, pKa, pKb and buffer solutions. Theory of indicators, solubility, solubility product, common ion effect and their industrial applications.

11. Chemistry of p-block Elements: Chemistry and structure of p-block elements; mainemphasis on the chemistry and structure of noble gases and their compounds, chemistry and structure of interhalogens, pseudohalogens and polyhalides.

Course Outcomes

12. At the end of the course, students will be able to understand the concept of periodic law and periodicity, principles of chemical bonding, acid-base chemistry, properties of p- block elements and to deal with qualitative and quantitative analysis of inorganic compoundsduring laboratory work.

Detail of Lab Work, workshop practice

a. Laboratory Ethics and Safety Measures: Awareness about the toxic nature ofchemicals and their handling, cleaning of glassware, safe laboratory operations.
b. Qualitative Analysis: Analysis of four ions (two anions and two cations) frommixture of salts.
c. Quantitative Analysis:
   (1) Volumetric Analysis: Practical exercises will be based on Redox, Iodometricand Iodimetric, Precipitation and Complexometric Reactions.
   (2) Gravimetric Analysis: Estimation of Ni^{2+}, Ba^{2+}. Determine percent of P andP_2O_5 in a sample of ammonium phosphomolybdate.

Recommended Book

13. Vogel, A. I., A Textbook of Micro and Semi-micro Qualitative Inorganic AnalysisLongman Green & Co., 1995. ”