

CHEM-105 + CHEM-106 CHEMISTRY-I (INORGANIC CHEMISTRY) Cr. 3(2+1)

Theory

Course Objectives

The Objective of the course are:-

1. To introduce students about the key introductory concepts of atomic structure and chemical bonding.
2. To introduce theories of acids and bases.
3. Survey of chemistry of p-block elements.
4. To learn about qualitative and quantitative analysis of inorganic compounds during laboratory work.

Course learning outcomes:

- Acquire the basic knowledge of determining molecular shapes.
 - Understand the concepts of acids and bases and use them efficiently
 - Solve the problems treated to pH, pKa, and buffer solutions
 - Understand the properties of p-block elements.
 - Carry to qualitative and quantitative analysis.
1. **Periodicity**
Diagonal and vertical relationship of first row element, electro negativity of elements (Pauling and Mulliken scales), Polari ability and polarizing power of ions, periodicity in the properties of outer transition and inner transition elements.
 2. **Chemical Bonding**
Types of chemical Bonding, theories of chemical bonding, and prediction of molecular shapes using valence shell electron pair repulsion (VSEPER) Model, Molecular orbital theory applied to diatomic molecules, bonding in electron deficient compounds.
 3. **Acid-Base Concept:**
General concept of acids and bases, detail of Lewis concept of acids and bases, Soft and Hard acid-base (SHAB) concept and its application, relative strength of acids and bases based on pKa value, Leveling effect, reaction of acids and bases, relationship between redox reactions and acid base reaction, Indicators and theory of indicators.
 4. **Chemistry of d- Block Element:**
Electronic configuration and oxidation states of transition elements, Nomenclature & theories of coordination compounds, Valence Bond Theory (VBT), Molecular Orbital Theory (MOT), and Crystal Field Theory (CFT) for octahedral complexes, Chelates, Applications of Coordination compounds.

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work: 25 marks

Midterm Exam: 35 marks

Final Exam: 40 marks

Recommended Books:

1. Cotton, F, Albert, Geoffrey Wilkinson and Paul L. Gaus, "Basic Inorganic Chemistry" John, Wiley Sons Ine, 3rd Edition (1995).
2. Lee, J.D., "Modem Inorganic Chemistry Champan & Hall, 5th Aditin (1996).
3. Jolly, William, L., "Modem Inroganic Chemsitry", McGraw Hill, 2nd Edition (1991)

Practical

1. Basic Introduction to preparation of different types of Solutions.

ARGENTOMETRY

MOHR,S Method

1. Determine the % purity of NaCl.
2. Determine the amount of Cl^{-1} in given sample solution.

REDOX TITRATIONS

1. Determine the amount/ dm^3 of $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ hydrate using potassium dichromate.
2. Determine of % of Iron in ferric Alum using $\text{K}_2\text{Cr}_2\text{O}_7$.
3. Determination of no. of water molecules in $\text{FeSO}_4 \cdot x\text{H}_2\text{O}$ using $\text{K}_2\text{Cr}_2\text{O}_7$.

ACID BASE TITRATIONS

1. Determine the strength of given acid/base solution.

SALT ANALYSIS

2. Separation and identification of two acid and two basic radicals from a mixture of two salts.

Books Recommended:

1. Vogel, "A.I.A. Test Book of Macro and Semi micro-qualitative Inorganic Analysis", Longman Green & Co., (1995).
2. Skoog, D.A., D.M. West and F.J. Holler, "Analytical Chemistry", 6th Edition, Saunders College Publications, (1994).
3. Javed Iqbal, Admin, "Theory and Practice of chromatography", Higher Education Commission, Islamabad, (2002).