School of Science
B.Sc. (Chemistry) Programme
Subject Code & Name: - BS04MJCHE2 Inorganic Chemistry-II

Teaching and Evaluation Scheme:

Teaching Scheme				Examination Scheme			
Credits				Component Weightage (%)			
				CCE		SEE	
L	T	P	Total	TH	PWE	TH	PWE
3	-	1	4	35	15	35	15

Programme Name	B.Sc.
Semester	IV
Course Code	BS04MJCHE2
Course Title	Inorganic Chemistry-II
Course Content Type (Th./Pr.)	Theory & Practical
Course Credit	3 + 1
Sessions+ Lab. Per Week	3 +2
Total Teaching/Lab. Hours	45 Theory Hours + 30 Practical Hours
* 2 Laboratory = 1 Session	

Learning Objectives

1. Familiarize students with the Arrhenius, Bronsted-Lowry and Lewis theories of acids and bases including their definitions and applications.
2. Learn the relationship between acid strength and the value of pKa and how it relates to the relative acidity of different compounds.
3. Identify conjugate acid-base pairs and understand how they relate to the strength of an acid or base.
4. Understand the criteria for classifying acids and bases as hard or soft based on their polarizability and other properties.
5. Learn that hard acids prefer to interact with hard bases while soft acids prefer to interact with soft bases.
6. Learn how the concept of hardness and softness relates to electronegativity and the ability of an atom to attract electrons.
7. Understanding monodentate, bidentate and polydentate ligands and their impact on complex stability.
8. Understanding how coordination numbers and ligand arrangements lead to specific geometries.

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Prerequisites (if any)

Learning Outcomes

On the Completion of this course, students will able to:

1. Identify and explain the characteristics of hard and soft acids and bases based on size, charge, polarizability and other factors.
2. Use the HSAB principle to predict the stability of acid-base complexes understanding that hard-hard and soft-soft interactions are generally more stable.
3. Define acids and bases according to Bronsted-Lowry and Lewis theories.
4. They should be able to name coordination compounds according to IUPAC rules.
5. Students should be able to identify and describe different types of isomerism in coordination compounds.
6. Students should be familiar with terms like coordination number, ligand field and complex ion.
7. Students should understand what constitutes a coordination compound including the central metal ion, ligands and coordination sphere.

Detailed Contents

UNIT	TOPIC/SUB-TOPIC	TEACHING HOURS
I	**Acid – Base Chemistry** Arrhenius concept-the water ion system, Lowry-Bronsted theory-the proton donor-acceptor system, Conjugate acid-base pairs, Relative strength of acids and bases, The leaving effect, levelling and differentiating solvents, utility and limitation of Bronsted, Arrhenius concept, The Lewis concept-the electron donor concept system, Classification of Lewis acids, Classification of Lewis acids and bases into Hard and Soft Acids and Bases, HSAB principle and stability of the complex Acid: Base, The Usanovich concept-the positive-negative system	15

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II	**Non-Aqueous Solvent** Classification of solvents, General properties of ionizing solvents (physical and chemical), Chemical reactions, Liquid ammonia as non-aqueous solvent, Solubility of substance in liq. NH_3, Advantage and disadvantage of using liq.NH_3 as a solvent, Auto-ionization of liq. NH_3, Chemical reactions occurring in liq. NH_3, Liquid Sulphur dioxide as solvent, Chemical reactions occurring in liquid Sulphur dioxide, Auto ionization of Hydrofluoric acid (Liquid HF), Auto ionization of BrF_3, Auto ionization of IF_5, Neutralization reaction, Difference between solvation and solvolysis	15
III	**Co-ordination Chemistry-I** Definitions of some important terms of coordination compounds, Werner's theory of coordination compounds, Ligands and classification of ligands, IUPAC nomenclature of coordination compounds Conformation isomerism, Ionization isomerism, Hydrate isomerism, Coordination isomerism, Linkage isomerism, Coordination position isomerism, Ligand isomerism, Stereo isomerism: Geometrical isomerism, Geometrical isomerism in 4 and 6 coordinated complex compounds, Cis and trans isomerism, Optical isomerism in 4 and 6 coordinated complex compounds.	15

Text Book(s)

Reference Books

1. Basic Inorganic Chemistry – Gurdeep & Chatwal.
2. Inorganic Chemistry - J. N. Gurtu & H. C. Khera
3. Advanced Inorganic Chemistry- Cotton and Wilkinson
4. Principles of Inorganic chemistry- B. R. Puri, L. R. Sharma and K. C. Kalia; Vallabh publications, Delhi.
5. Concise Inorganic Chemistry - J. D. Lee
6. Selected Topic in Inorganic Chemistry, 8th -edition, by Wahid U. Malik, G.D. Tuli and R.D. Madan
7. Advance Inorganic Chemistry (Volume-II) by Satya Prakash, G. D. Tuli, S.K. Basu, R. D. Madan

Web Resources

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Required Software(s) (if any)	
Practical(s) (if any)	
Gravimetric Analysis: 1. Determine the amount of iron (Fe^{2+}) as Fe_2O_3 gravimetrically in the given solution of $FeSO_4(NH_4)_2SO_4$ $6H_2O$ or $FeSO_4 7H_2O$ and free H_2SO_4 2. Determine the amount of Aluminum (Al^{3+}) as Al_2O_3 gravimetrically in the given solution of $Al_2(SO_4)_3$ $18H_2O$ and free H_2SO_4 3. Determine the amount of Barium (Ba^{2+}) as $BaSO_4$ gravimetrically in the given solution of $BaCl_2.2H_2O$ and free HCl 4. Determine the amount of Nickel (Ni^{2+}) as Ni $(DMG)_2$ gravimetrically in the given solution of $NiCl_2.2H_2O$ and free HCl	30

L:: Lecture, **T::** Tutorial , **P::**Practical

CCE:: Continuous and Comprehensive Evaluation

(CCE Theory includes Mid Semester Examination, Assignment, MCQ quizzes, Seminar, Reflective notes, class participation, case analysis and presentation, slip tests (announced/ surprised), attendance etc. or any combination of these)

PWE:: Practical Work Examination

(PWE includes Laboratory practical work, project work, viva simulation exercise work etc.)

SEE:: Semester End Evaluation