

Programme Code	Course Title				Course Code
CHYUG1960	GENERAL CHEMISTRY-I				U25CH1
Course Type	Year	Semester	Category	Hours /Week	Credits
Core	I	I	Lecture	5	5

Course description

This course describes the electronic structure and periodic properties of elements. The main objective of this course is to inculcate the basic knowledge of practical's related to volumetric analysis. Further the basic concepts related to organic chemistry including classification of bonding, cleavage of organic molecules. This course also leads to identify the nature of solutions and the concept behind in macro molecules and also have an idea about the theories of gaseous molecules.

Course Objective:

- To understand the fundamentals of atoms and periodicity of elements.
- To get a knowledge on some selected chemical bonds and to learn the various theories of bonding.
- To learn the concepts of polar effects and reactive intermediates in organic reactions.
- To learn about the behavior of ideal and real gases.
- To understand the concepts of concentration of solutions and macromolecules.

UNIT-I: Electronic Structure and Periodic Properties (15 Hours)

1.1. Electronic Structure: Quantum numbers-principal, angular momentum, magnetic and spin quantum numbers and their significance - principles governing the occupancy of electrons in various quantum levels - Pauli's exclusion principle - Aufbau principle - Hund's rule - (n+1) rule - stability atomic orbitals with atomic number.

1.2. Periodic properties: Variation of atomic volume, atomic and ionic radii, ionization potential, electron affinity and electro negativity along periods and groups - factors affecting periodic properties Pauling's and Mulliken's scales of electro negativity and its applications.

UNIT-II: Titrimetric Analysis (15 Hours)

2.1. Volumetric analysis: Definitions - standard solutions, equivalence point, end point, concentration units - molarity, molality, normality, mole fraction, primary and secondary standards. Solutions - Definition of ideal and non-ideal solutions - concentration units - weight percent and volume percent. **2.2. Types of titrimetric reactions:** - Acid-base, redox, precipitation, displacement and complexometric titrations - acid-base indicators (phenolphthalein and methyl orange) and redox indicators.

2.3. Oxidation-reduction: oxidation number and oxidation states - equivalent weights of oxidizing and reducing agents - balancing redox equations by oxidation number method and ion-electron method.

UNIT-III: Basic concepts in Organic Chemistry and Electronic effects (15 Hours)

3.1. IUPAC nomenclature of simple aliphatic and alicyclic compounds. Priorities of functional groups in polyfunctional compounds.

3.2. Classification and Cleavage of bonds: Catenation and classification of organic compounds.

3.3. Bonding: Types of bonds – ionic, covalent and coordinate bonds, bond length, bond energy, orbital overlap – sigma and pi bonds – hybridization and geometry of molecules methane, ethane, ethylene, acetylene and benzene.

3.4. Polar effects and reactive intermediates: heterolytic and homolytic; inductive, electromeric, resonances, resonance energy, conditions for resonance. Hyperconjugation, carbocations, carbanions, free radicals, and dipole moment

UNIT-IV: Gaseous State (15 Hours)

4.1. Kinetic Molecular Theory of Gases: The Gas constant 'R' in different units - Maxwell-Boltzmann distribution of molecular velocities- Root mean square, average and most probable velocities (no derivation).

4.2. Collision number and mean free path - Collision diameter. Deviation from ideal behavior - Van der Waal's equation for real gases.

4.3. Critical Phenomena - PV isotherms of real gases, critical temperature, and continuity of state - relation between critical constants and Vander Waal's constants - Determination of critical volume - the law of corresponding states - reduced equation of state.

UNIT-V: Chemical Equilibrium and Macromolecules (15 Hours)

5.1 Chemical equilibrium: Equilibrium constant and free energy change - thermodynamic derivation of law of mass action – equilibrium constants in terms of pressure and concentration - NH_3 , PCl_5 , - thermodynamic interpretation of Le Chatelier's principle.

5.2. Macromolecules: Number average and weight average molecular weight of macromolecules - determination of molecular weight by osmometry (number average), ultra-centrifuge (weight average), Viscometry and light scattering.

Teaching Methodology: Chalk & Talk, PPT, ICT, videos and demonstration

Book for study:

1. P.L. Soni, MohanKatyayal, "TextbookofInorganicChemistry", 20th Revised Ed., (2007), Sultan Chand & Sons, NewDelhi. (UNITS I & II)

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THE CANDIDATES ADMITTED FROM THE ACADEMIC YEAR 2025-2026)

2. R.D.Madan, "Modern Inorganic Chemistry", 6th Ed., (2008), S.Chand and Company Ltd., New Delhi. (UNITS I & II)
3. J.D.Lee, "A New Concise Inorganic Chemistry", Oxford Publishers, 5th Ed., 2014. (UNITS I & II)
4. A. Bahl, B. S. Bhal, A Textbook of Organic chemistry, S. Chand and Company Ltd., New Delhi, 22nd Ed., 2016. (UNIT III)
5. P. L. Soni, "Text book of Organic Chemistry", S. Chand and Company Ltd., New Delhi, 28th Ed., 2004. (UNIT III)
6. R. T. Morrison and R. N. Boyd., "Organic Chemistry", Prentice Hall of India Pvt. Ltd., New Delhi, 7th Ed., 2011. (UNIT III)

Book for Reference:

1. Okhil K. Medhi, Ellen A. Keiter, James E. Huheey, Richard L. Keiter, Dorling Kindersley, "Inorganic Chemistry: Principles of Structure and Reactivity", India, 4th Ed., 2006.
2. Carey, Francis A., Sundberg, Richard J., Springer, "Advanced Organic Chemistry Part A: Structure and Mechanisms", New York, 5th Ed., 2007.

Website and e- Learning Sources

1. <https://chem.libretexts.org/>
2. <https://edu.rsc.org/>
3. <https://www.scribbr.com/>
4. <https://ocw.mit.edu/>
5. <http://hyperphysics.phy-astr.gsu.edu/hbase/hph.html>

Semester	Course code	Title of the Course	Hours	Credits
I	U25CH1	GENERAL CHEMISTRY – I	5	
CO. No.	CO-Statement			Cognitive Level
	On successful completion of this course, students will be able to			(K-Level)
CO-1	acquire the knowledge about periodicity and periodic trends, Nomenclature			K1
CO-2	understand the basic of Titrimetric Analysis, real and ideal gases			K2
CO-3	understand the polar effects and reactive intermediates of hydrocarbons			K2
CO-4	apply the kinetic molecular theory and find the velocities of molecules			K3
CO-5	analyze the bonding in molecules and molecular geometry			K4
CO-6	evaluation of molecular weight by osmometry, ultra-centrifuge, viscometry and light scattering			K5

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Semester	Course code	Title of the Course				Hours	Credits
I	U25CH1	General Chemistry-I				5	
(COs)	Programme Outcomes (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	
CO1	9	9	9	9	3	3	
CO2	9	3	9	9	3	3	
CO3	9	9	9	3	3	9	
CO4	9	9	3	3	9	3	
CO5	9	9	3	3	3	3	
CO6	9	9	3	3	3	3	
Weightage	54	48	36	36	24	24	
Weighted percentage of Course contribution to POs	100 %	88 %	66 %	66 %	44 %	44 %	
Mapping Correlation	Low		Medium		High	No Correlation	
Level of Correlation	1		3		9	0	

Course Outcomes mapped with Knowledge level (Revised Bloom's Taxonomy) and POs

CO / K - Level	Level of Correlation			
	High	Medium	Low	Zero
CO 1 / K1	PO1, PO2, PO3, PO4	PO5, PO6,	--	--
CO 2 / K2	PO1, PO3, PO4	PO2, PO5, PO6,	--	--
CO 3 / K3	PO1, PO2, PO3, PO6	PO4, PO5	--	--
CO 4 / K4	PO1, PO2, PO5	PO3, PO4, PO6	PO3	
CO 5 / K5	PO1, PO 2	PO3, PO5	PO2, PO6	--
CO 6 / K6	PO1, PO2	PO3, PO4, PO5, PO6	--	--

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Course Outcome (CO) Attainment Assessment Tools & Evaluation Procedure:

K Levels	C1	C2	C3	Total scholastic marks	Non-Scholastic Marks C4	CIA Total	% of Assessment
	T1 4 Marks	T2 10 Marks	Assignment 6 Marks	20 Marks	5 Marks	25 Marks	
K1	1	1	1	4		3	12
K2	1	1	1	3		3	12
K3	1	2	1	3		4	16
K4	1	2	1	4		4	16
K5		2	1	2		3	12
K6		2	1	4		3	12
Non-Scholastic	--	--	--	--		5	20
Total	4	10	6	20	5	25	100%

The COs and POs for the General Chemistry-I course in the B.Sc. Chemistry Programme is effectively matched by the Course Teacher.

The COs and POs for the General Chemistry-I course in the B.Sc. Programme is effectively matched by the Course In-charge.

Signature of the Course In-charge

Signature of the HoD

Programme Code	Course Title				Course Code
CHYUG1960	CORE PRACTICAL - I - SEMI-MICRO ANALYSIS				U25CH2P
Course Type	Year	Semester	Category	Hours /Week	Credits
Core	I	I	Practical	3	4

Course description

Inorganic Qualitative Analysis identifies cations and anions in mixtures using semi-micro techniques, focusing on separation and identification through conventional methods, including hydrogen sulfide precipitation, covering various cations and anions, and addressing interference challenges.

Course Objectives:

- To identify the anions and cations
- To know the tests and spot tests for cations

Inorganic Qualitative Analysis

Analysis of a mixture containing two cations and two anions of which one will be an interfering ion. Semi micro methods using the conventional scheme with hydrogen sulphide may be adopted.

Cations to be studied: lead, copper, bismuth, cadmium, antimony, tin, iron, aluminium, zinc, manganese, cobalt, nickel, barium, calcium, strontium, magnesium and ammonium.

Anions to be studied: Carbonate, sulphide, sulphate, nitrate, bromide, fluoride, borate, oxalate, arsenite, arsenate and phosphate.

Course Outcomes:

1. Knowledge on conditions of precipitations
2. Knowing about solutions, identification of specific colors of ions
3. To know about interfering radicals

Book for Study

1. Practical Chemistry by A.O. Thomas, Scientific Book Centre, Cannanore, 2003.
2. Basic Principles of Practical Chemistry, V. Venkateswaran, R. Veeraswamy, A. R. Kulandaivelu, Sultan Chand & Sons, New Delhi, 2nd Ed., 2004.

Book for Reference

1. Vogel's Qualitative Inorganic Analysis, G. Svehla, 7th Ed., Dorling Kindersley, India, 4th Ed., 2009.

Scheme of Valuation

Maximum Marks: 75 Marks

Practical : 60 marks

Record : 10 marks

Viva-Voce : 05 marks

Total : 75 marks

4 radicals correct with suitable tests : 60 marks

3 radicals correct with suitable tests : 45 marks

2 radicals correct with suitable tests : 30 marks

1 radical correct with suitable tests : 15 marks

Semester	Course code	Title of the Course	Hours	Credits
I	U25CH2P	CORE PRACTICAL –I SEMI-MICRO ANALYSIS	3	4
CO. No.	CO-Statement On successful completion of this course, students will be able to			Cognitive Level (K-Level)
CO-1	detect the simple acid radicals and the interfering radicals			
CO-2	eliminate the interfering radicals, understand the possible combinations of the radicals and their detection			K2
CO-3	understand the idea behind the grouping of cations, like common ion effect, ionic product, solubility product			K3
Co-4	understand and perform the separation of cations in to groups, detection of cations			K4
CO-5	understand why the cations in a particular group must be eliminated before proceeding to the subsequent groups			K4
CO-6	learn to do the flame test and to understand the idea of performing a flame test. Learn the proper use of Kip's apparatus, and centrifuge machine. Gain confidence while working in the chemistry lab, making them confident of getting a job a chemical company/industry.			K4

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I	U25CH2P	CORE PRACTICAL -I SEMI-MICRO ANALYSIS				3	4
(COs)	Programme Outcomes (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	
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CO 4 / K4	PO1, PO2, PO5	PO3, PO4, PO6	PO3	
CO 5 / K5	PO1, PO2	PO3, PO5	PO2, PO6	--
CO 6 / K6	PO1, PO2	PO3, PO4, PO5, PO6	--	--

Course Outcome (CO) Attainment Assessment Tools & Evaluation Procedure:

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K2							
K3							
K4							
K5							
K6							
Non-Scholastic							
Total	4	10	6	20	5	25	100%

The COs and POs for the Semi-Micro Analysis Practical –I course in the B.Sc. Chemistry Programme is effectively matched by the Course Teacher.

The COs and POs for the Semi-Micro Analysis Practical –I course in the B.Sc. Programme is effectively matched by the Course In-charge.

Signature of the Course In-charge

Signature of the HoD