

Lecture Plan		
Name of the college: Government College of Arts, Science and Commerce, Sanquelim- Goa		
Name of Faculty: Ms. Dipika Gosavi	Subject: Chemistry	
Paper code: CHC-111	Program: F Y BSc	Division: A
Academic year: 2025 - 2026	Semester: V	Total Lectures: 15
Course Objectives: : To develop a strong foundation in Molecular spectroscopy by understanding fundamental concepts, applying mathematical : and performing related problem-solving and experimental analysis.		
Expected Course Outcome: - Understand and explain the fundamental concepts of thermodynamics, including thermodynamic systems, processes, properties, and the first law of thermodynamics, and apply them to solve numerical problems. - Analyze solutions and chemical equilibria, applying Raoult's law, Henry's law, and thermodynamic principles to predict behavior and calculate relevant quantities in liquid and gaseous systems. - Comprehend basic concepts of organic chemistry, including types of reactions, intermediates, and properties of selected organic compounds, and perform basic preparation and characterization techniques.		
Student Learning Outcome: - Identify and classify thermodynamic systems and processes, differentiate between intensive and extensive properties, and apply the first law of thermodynamics to calculate work, heat, internal energy, and enthalpy changes. - Solve numerical problems related to expansion of ideal gases, solution concentrations, solubility of gases, and chemical equilibria using thermodynamic and solution principles. - Illustrate and explain types of organic reactions with examples, and analyze the structure and stability of reaction intermediates such as carbocations, carbanions, and free radicals.		

4. Describe the structure, properties, uses, and laboratory preparation methods of selected organic compounds, and relate their chemical behavior to practical applications.

Month	Lecture From	Lecture To	No. of lectures allotted	Topic, Subtopic to be covered	Exercise/ Assignment	ICT Tools	Reference books
June	20/06/2025	28/06/2025	1	Definition of thermodynamic terms: system, surroundings, boundary	Assignment: Define system, surroundings, and boundary with suitable examples. Classify whether the following are systems, surroundings, or boundaries: a cup of hot coffee, a closed pressure cooker, the atmosphere around a candle flame.	Power point presentation/ Smart board	A. Bahl, B.S Bahl and G.D. Tuli, Essentials of Physical Chemistry, S. Chand Publication. 2009. 2. Puri, Sharma and Pathania, Principles of Physical Chemistry. 47th edition. 2020.
July	30/06/2025	05/07/2025	1	Types of thermodynamic systems: open, closed, isolated	Assignment: Explain the differences between open, closed, and isolated systems with examples. Identify the type of system in the following cases: boiling water in an open vessel, a sealed gas cylinder, the universe.	Power point presentation/ Smart board	A. Bahl, B.S Bahl and G.D. Tuli, Essentials of Physical Chemistry, S. Chand Publication. 2009. 2. Puri, Sharma and Pathania, Principles of Physical Chemistry. 47th edition. 2020.
July	07/07/2025	12/07/2025	1	Types of thermodynamic processes: isothermal, adiabatic, isobaric, isochoric, cyclic, reversible, irreversible	Assignment: Define each type of thermodynamic process with one example. Draw the PV diagram for isothermal and adiabatic processes and explain the	Power point presentation/ Smart board	A. Bahl, B.S Bahl and G.D. Tuli, Essentials of Physical Chemistry, S. Chand Publication. 2009. 2. Puri, Sharma and Pathania, Principles of Physical Chemistry. 47th edition. 2020.

					difference in work done during these processes.		
July	14/07/2025	19/07/2025	1	Intensive and extensive properties with examples	Assignment: Define intensive and extensive properties. Classify the following as intensive or extensive: pressure, temperature, volume, mass, density, internal energy. Explain why density is considered an intensive property even though it depends on mass and volume.	Power point presentation/ Smart board	A. Bahl, B.S Bahl and G.D. Tuli, Essentials of Physical Chemistry, S. Chand Publication. 2009. 2. Puri, Sharma and Pathania, Principles of Physical Chemistry. 47th edition. 2020.
July	21/07/2025	26/07/2025	1	Concept of heat and work with sign conventions	Assignment: Explain the concepts of heat and work in thermodynamics. Describe the sign conventions for heat absorbed/released and work done by/on the system. Calculate the work done when 2 moles of an ideal gas expand isothermally from 10 L to 20 L at 300 K.	Power point presentation/ Smart board	A. Bahl, B.S Bahl and G.D. Tuli, Essentials of Physical Chemistry, S. Chand Publication. 2009. 2. Puri, Sharma and Pathania, Principles of Physical Chemistry. 47th edition. 2020.
July/ August	28/07/2025	02/08/2025	1	First law of thermodynamics: mathematical statement and significance	Assignment: State and explain the first law of thermodynamics. Derive the mathematical expression $\Delta U = q + w$. Solve a numerical problem: An ideal gas	Power point presentation/ Smart board	A. Bahl, B.S Bahl and G.D. Tuli, Essentials of Physical Chemistry, S. Chand Publication. 2009. 2. Puri, Sharma and Pathania, Principles of Physical Chemistry. 47th edition. 2020.

					absorbs 500 J of heat and does 200 J of work. Calculate the change in internal energy.		
August	04/08/2025	09/08/2025	1	Definition of internal energy and enthalpy	Assignment: Define internal energy and enthalpy. Derive the relationship $H = U + PV$. Explain how enthalpy changes are related to heat transfer at constant pressure.	Power point presentation/ Smart board	A. Bahl, B.S Bahl and G.D. Tuli, Essentials of Physical Chemistry, S. Chand Publication. 2009. 2. Puri, Sharma and Pathania, Principles of Physical Chemistry. 47th edition. 2020.
August	11/08/2025	16/08/2025	1	Heat capacity: specific and molar heat capacities at constant volume and constant pressure, relationship between C_v and C_p	Assignment: Define heat capacity, specific heat capacity, and molar heat capacity. Derive the relation $C_p - C_v = R$ for an ideal gas. A sample of 1 mole of an ideal gas is heated at constant volume from 300 K to 350 K. Calculate the change in internal energy if $C_v = 12.5 \text{ J/mol}\cdot\text{K}$.	Power point presentation/ Smart board	A. Bahl, B.S Bahl and G.D. Tuli, Essentials of Physical Chemistry, S. Chand Publication. 2009. 2. Puri, Sharma and Pathania, Principles of Physical Chemistry. 47th edition. 2020.
August	18/08/2025	23/08/2025	1	Calculation of work (w), heat (q), change in internal energy (ΔU) and enthalpy (ΔH) for expansion of ideal gases under isothermal reversible conditions	Assignment: Derive the expressions for work (w), heat (q), change in internal energy (ΔU), and enthalpy (ΔH) for an ideal gas undergoing isothermal reversible expansion.	Power point presentation/ Smart board	A. Bahl, B.S Bahl and G.D. Tuli, Essentials of Physical Chemistry, S. Chand Publication. 2009. 2. Puri, Sharma and Pathania, Principles of Physical Chemistry. 47th edition. 2020.
August	25/08/2025	30/08/2025	CHATURTHI BREAK				

September	01/09/2025	06/09/2025	1	Solutions of liquids in liquids: Raoult's law, ideal solutions, deviations from Raoult's law; ways of expressing concentration: molarity, normality, molality, mole fraction, parts per million	A sample problem: 1 mole of an ideal gas expands reversibly and isothermally at 300 K from 10 L to 20 L. Calculate w, q, ΔU , and ΔH .	Power point presentation/ Smart board	A. Bahl, B.S Bahl and G.D. Tuli, Essentials of Physical Chemistry, S. Chand Publication. 2009. 2. Puri, Sharma and Pathania, Principles of Physical Chemistry. 47th edition. 2020.
September	08/09/2025	13/09/2025	1	Solutions of gases in liquids: factors influencing solubility of gases, Henry's law, numerical problems on solutions and Henry's law	Assignment: Explain Raoult's law for ideal solutions. Discuss positive and negative deviations with examples. Convert the following solution concentrations: (a) 0.5 M HCl to molality, (b) 0.1 mole fraction of ethanol in water to percentage composition by mass.	Power point presentation/ Smart board	A. Bahl, B.S Bahl and G.D. Tuli, Essentials of Physical Chemistry, S. Chand Publication. 2009. 2. Puri, Sharma and Pathania, Principles of Physical Chemistry. 47th edition. 2020.
September	15/09/2025	20/09/2025	1	Chemical equilibrium: free energy change in a chemical reaction, definition of ΔG and ΔG° ; thermodynamic derivation of the law of chemical equilibrium	Calculate the solubility of oxygen in water at 1 atm pressure if the Henry's law constant is $1.3 \times 10^{-3} \text{ mol L}^{-1} \text{ atm}^{-1}$. How does the solubility change at 0.5 atm?	Power point presentation/ Smart board	A. Bahl, B.S Bahl and G.D. Tuli, Essentials of Physical Chemistry, S. Chand Publication. 2009. 2. Puri, Sharma and Pathania, Principles of Physical Chemistry. 47th edition. 2020.
September	22/09/2025	27/09/2025	1	Le Chatelier's principle with examples; relationships between K_p , K_c , and K_x for reactions involving ideal gases	Assignment: State Henry's law and explain factors affecting gas solubility in liquids.	Power point presentation/ Smart board	A. Bahl, B.S Bahl and G.D. Tuli, Essentials of Physical Chemistry, S. Chand Publication. 2009. 2. Puri, Sharma and Pathania, Principles of Physical Chemistry. 47th edition. 2020.
September/ October	29/09/2025	04/10/2025	1	Types of organic reactions with examples: addition, elimination, substitution, oxidation, reduction, and	. Explain the structure and stability of carbocations, carbanions, and free	Power point presentation/ Smart board	A. Bahl, B.S Bahl and G.D. Tuli, Essentials of Physical Chemistry, S. Chand Publication. 2009. 2. Puri, Sharma and Pathania, Principles of Physical Chemistry. 47th edition. 2020.

				rearrangement; structure and stability of intermediates: carbocation, carbanion, free radical	radicals with suitable examples.		
October	06/10/2025	11/10/2025	1	Structure, properties, and uses of selected organic compounds (ethanol, acetone, ethyl acetate, formaldehyde, acetylene, benzoic acid, n-butane, chloroform, diethyl ether, cresol, benzaldehyde, aniline, urea, glucose, lauric acid) and their preparations (ethanol, benzoic acid, acetone, acetylene, ethyl acetate, diethyl ether)	Assignment: Define and give two examples each of addition, elimination, substitution, oxidation, reduction, and rearrangement reactions	Power point presentation/ Smart board	A. Bahl, B.S Bahl and G.D. Tuli, Essentials of Physical Chemistry, S. Chand Publication. 2009. 2. Puri, Sharma and Pathania, Principles of Physical Chemistry. 47th edition. 2020.
October	13/10/2025	18/10/2025	1	Structure, properties, and uses of selected organic compounds (ethanol, acetone, ethyl acetate, formaldehyde, acetylene, benzoic acid, n-butane, chloroform, diethyl ether, cresol, benzaldehyde, aniline, urea, glucose, lauric acid) and their preparations (ethanol, benzoic acid, acetone, acetylene, ethyl acetate, diethyl ether)	Assignment: Define and give two examples each of addition, elimination, substitution, oxidation, reduction, and rearrangement reactions	Power point presentation/ Smart board	A. Bahl, B.S Bahl and G.D. Tuli, Essentials of Physical Chemistry, S. Chand Publication. 2009. 2. Puri, Sharma and Pathania, Principles of Physical Chemistry. 47th edition. 2020.
October	21/10/2024	21/10/2024	1	Structure, properties, and uses of selected organic compounds (ethanol, acetone, ethyl acetate, formaldehyde, acetylene, benzoic acid, n-butane, chloroform, diethyl ether, cresol, benzaldehyde, aniline, urea, glucose, lauric	Assignment: Define and give two examples each of addition, elimination, substitution, oxidation, reduction, and rearrangement reactions	Power point presentation/ Smart board	A. Bahl, B.S Bahl and G.D. Tuli, Essentials of Physical Chemistry, S. Chand Publication. 2009. 2. Puri, Sharma and Pathania, Principles of Physical Chemistry. 47th edition. 2020.

			acid) and their preparations (ethanol, benzoic acid, acetone, acetylene, ethyl acetate, diethyl ether)			
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Assessment Rubrics

Component	Max Marks
ISA 1	7.5
ISA 2	7.5
Practical	-
Project	-
Semester End Exam	45