



बिरसा मुंडा ट्रायबल युनिवर्सिटी

Birsa Munda Tribal University

राजपिपला, जि० नर्मदा Rajpipla, Dist. Narmda

Established by Tribal Development Department, Govt. of Gujarat

School of Science

M.Sc. (Chemistry) Programme

Subject Code & Name: - MS01CCHE02 & Physical Chemistry - I

Teaching and Evaluation Scheme:

Teaching Scheme				Examination Scheme			
Credits				Component Weightage			
				Internal		External	
L	T	P	Total	TH	PWE	TH	PWE
4	-	-	4	50	-	50	-

Programme Name	M.Sc. Chemistry
Semester	I
Course Code	MS01CCHE02
Course Title	Physical Chemistry - I
Course Content Type (Th./Pr.)	Theory
Course Credit	4
Sessions+ Lab. Per Week	4
Total Teaching/Lab. Hours	60 Hours
* 2 Laboratory = 1 Session	

Learning Objectives

1. To help with the quantification and comprehension of several physical chemistry concepts that have already been studied at the UG level, the concepts of chemical thermodynamics, chemical kinetics, electrochemistry, and surface sciences will be expanded.
2. The course material aims to advance the theoretical foundation, practical applications, and fundamentals of chemical kinetics, surface sciences, electrochemistry, and thermodynamics.
3. In order to solve chemical science problems, the students will learn how to interpret chemical thermodynamics, chemical kinetics, electrochemistry, and surface chemistry techniques.

Prerequisites (if any)

Learning Outcomes

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

1. Determine and correlate concepts of laws of thermodynamics, free energy, chemical potential and entropies, partial molar properties, ideal and non-ideal systems.



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2. Rationalize scope of chemical kinetics, quantify the ideas (not overshadowed by mathematics) about the behavior of molecules and systems in order to be able to cope with experimental methods of chemical kinetics, think and reflect importance of reaction mechanisms.
3. Recognize the electrochemistry principles for understanding the solution properties and behavior
4. Identify and distinguish the ideal and non-ideal systems in terms of excess functions, activity and activity coefficient of electrolytic solutions in terms of Debye-Huckel and Onsager theories and models to realize charge interfaces and over-potentials etc.
5. Understand surface phenomenon, micellization process, phase separation and mass action models.

Detailed Contents		
UNIT	TOPIC/SUB-TOPIC	TEACHING HOURS
I	Chemical Kinetics-I: Chemical kinetics and its scope, rate of reaction, factors influencing the rate of a reaction, measurements of reaction rates, differential and integral rate laws, rate laws and equilibrium constants for elementary reactions, temperature dependence of rate constants, Arrhenius equation, concept of activation energy, reaction mechanisms and examples ; uni-molecular reactions, bi-molecular reactions, trimolecular reactions,	15
II	Chemical Thermodynamics: Brief resume of concepts of laws of thermodynamics, free energy, chemical potential and entropies. Maxwell's relations; Partial molar properties: partial molar free energy, partial molar volume and partial molar heat content and their significances. Determinations of these quantities. Concept of fugacity and determination of fugacity, Non-ideal systems : Excess functions for non-ideal solutions, Activity, activity coefficient, Debye-Huckel theory for activity coefficient of electrolytic solutions; determination of activity and activity coefficients ; ionic strength	15
III	Electrochemistry: Nernst equation, redox systems, electrochemical cells; DebyeHuckel theory; electrolytic conductance – Kohlrausch's law and its applications; ionic equilibria, conductometric and potentiometric titrations, Thermodynamics of electrified interface equation, Derivation of electro-capillary, Lippmann equations (surface excess), Over potentials, exchange current density, derivation of Butler-Volmer equation, Tafel plot.	15



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IV	Surface Chemistry: Surface tension, capillary action, pressure difference across curved surface (Laplace equation), vapour pressure of droplets (Kelvin equation), Surface films on liquids (Electro-kinetic phenomenon), catalytic activity at surface. Micelles : Surface active agents, classification of surface active agents, micellization, hydrophobic interaction, critical micelle concentration (CMC), factors affecting the CMC of surfactants, thermodynamics of micellization – phase separation and mass action models	15
Text Book(s)		
1. An Introduction to Chemical Thermodynamics, R. P. Rastogi and P. R. Misra, (Vikas Publishing House Pvt.Ltd. 2. Fundamentals of Chemical Thermodynamics, M. L. Lakhanpal, (Tata McGraw-Hill Publishing Company, New Delhi) 3. Principles of Physical Chemistry, Puri, Sharma and Pathania (Vishal publishing Co.) 4. Chemical Kinetics, K. J.Laidler, Mc-Graw Hill Publisher		
Reference Books		
1. Thermodynamics, P. C. Rakshit, (The New Book Stall, Calcutta) 2. Physical Chemistry, Ira N Levine (Tata McGraw-Hill Publishing Company, New Delhi, Fifth Edition) 3. Micelles, Theoretical and Applied Aspects, V. Moroi, Plenum Press 4. Thermodynamics for Chemists, S. Glasstone, (East-West Edition, Third Edition)		
Web Resources		
1. www.nptel.ac.in 2. www.swayam.gov.in 3. www.epgp.inflibnet.ac.in (e-PG pathshala) 4. www.ndl.iitkgp.ac.in (National Digital Library)		
Required Software(s) (if any)		
Practical(s) (if any)		

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

PWE:: Practical Work Examination

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