

DEPARTMENT OF CHEMISTRY
FACULTY OF SCIENCE AND HUMANITIES
SRM UNIVERSITY
LESSON PLAN

Academic Year : 2016 - 2017

Subject : **Physical Chemistry - II**

Subject Code : **PCY15203**

Semester : II

Class : M. Sc. I Year


Total No. Hours : 60


Title	Topics	Lecture No.	Reference Books
UNIT III Statistical Thermodynamics	Aims of statistical thermodynamics, definition of state of a system and review of classical thermodynamics	1	1. K. Rajaram, Chemical Thermodynamics: Classical, Statistical and Irreversible, Dorling Kindersley (India) Pvt Ltd., 2013. 2. B. R. Puri, L. R. Sharma and M. S. Pathania, Principles of Physical Chemistry; Vishal Publishing Co. 2015; 46 th Ed. 3. Gilbert W. Castellan (2004): Physical Chemistry, 4 th edition, Narosa Publishing House.
	ensembles (microcanonical and canonical)	2	
	Boltzmann distribution law and its derivation	3	
	Quantum statistics- Fermi Dirac	4	
	Bose-Einstein statistics	5	
	Boltzmann-Planck equation, partition functions	6	
	Derivations of thermodynamic properties from partition functions	7	
	Partition function and equilibrium constant	8	
	photon gas, electron gas according to such statistics	9	
	population inversion, negative Kelvin temperature	10	
	Einstein's theory of heat capacities of solids	11	
	Debye's theory of heat capacities of solids	12	
UNIT I Electrochemical Phenomena	Nuclear spin statistics-statistical basis of entropy of H ₂ gas- ortho and para nuclear states- Calculation of entropy in terms of ortho- para ratio – residual entropy of H ₂ at 0 K.	13	
	Evidences for electrical double layer	14-15	
	Electrocapillary phenomena-Electro capillary curves	16	
	Electro-osmosis, electrophoreses, Streaming and Sedimentation potentials	17	
	Zeta potentials and its determination by electrophoresis,	18	
	Influence of ions on Zeta potential	19	
	Helmholtz-Perrin model	20	
	Guoy-Chapmann model	21	
	Stern models of electrical double layer-Applications and limitations	22-23	
UNIT II Chemical Kinetics	Kinetics of electrode process. Energy barrier at electrode surface- electrolyte interface	24	
	Comparison between gas phase and solution reactions, Cage effect	25	
	The influence of the solvent on the reactions between ions and reaction between ions and neutral molecules,		

II	Influence of ionic strength on rates of reactions in solution	26	
	ARRT to reaction in solution	27	
	Significance of volume and entropy of activation	28	
	Primary and secondary salt effect	29	
UNIT IV Basics of Group Theory	Symmetry elements and symmetry operations, group and its properties, Multiplication table, point symmetry groups, Schoenflies symbol, representations of groups by matrices	30-34	1. R. K. Prasad, Quantum chemistry, 4th edition, New Age International, 2010. 2. F. A. Cotton, Chemical applications of group theory, 3rd edition, John Wiley & Sons., 2004.
	Irreducible representation of groups, the Great Orthogonality theorem, construction of character table (C _{2v} , C _{3v} only)	35-39	
	Applications of group theory to normal modes analysis, Selection rules for fundamental vibrational transition	40-42	
	IR and Raman activity of fundamentals in H ₂ O, BF ₃ , The rule of mutual exclusion	43-44	
UNIT V Basics of Quantum Mechanics	de-Broglie's concept, experimental verification- Compton effect	45	R. K. Prasad, Quantum chemistry, 4th edition, New Age International, 2010.
	Heisenberg's uncertainty principle – derivation of Schrodinger wave equation	46-47	
	Requirements of the acceptable wave function. Operators, linear operators,	48-50	
	Method of getting the following quantum mechanical operators: Position, Momentum, kinetic energy, potential energy, total energy, angular momentum	51-55	
	Hermiticity and proving the quantum mechanical operators are Hermitian operation- commutator algebra-evaluation of commutators	56-58	
	Eigen functions and eigen values - postulates of quantum mechanics	59, 60	

STAFF DETAILS

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