

T.Y.B.Sc. CHEMISTRY (3 UNITS)
Choice Based Credit System
To be implemented from the Academic year 2018-2019

SEMESTER V

PHYSICAL CHEMISTRY

COURSE CODE: USCH501

CREDITS: 01

LECTURES: 30

UNIT	TOPIC	NO. OF Lectures
UNIT I	1.0 MOLECULAR SPECTROSCOPY	15L
	<p>1.1 Rotational Spectrum: Introduction to dipole moment, polarization of a bond, bond moment, molecular structure, .Rotational spectrum of a diatomic molecule, rigid rotor, moment of inertia, energy levels, conditions for obtaining pure rotational spectrum, selection rule, nature of spectrum, determination of internuclear distance and isotopic shift.</p> <p>1.2 Vibrational spectrum: Vibrational motion, degrees of freedom, modes of vibration, vibrational spectrum of a diatomic molecule, simple harmonic oscillator, energy levels, zero point energy, conditions for obtaining vibrational spectrum, selection rule, nature of spectrum.</p> <p>1.3 Vibrational-Rotational spectrum of diatomic molecule: energy levels, selection rule, nature of spectrum, P and R branch lines. Anharmonic oscillator - energy levels, selection rule, fundamental band, overtones. Application of vibrational-rotational spectrum in determination of force constant and its significance. Infrared spectra of simple molecules like H₂O and CO₂.</p> <p>1.4 Raman Spectroscopy : Scattering of electromagnetic radiation, Rayleigh scattering, Raman scattering, nature of Raman spectrum, Stoke's lines, anti-Stoke's lines, Raman shift, quantum theory of Raman spectrum, comparative study of IR and Raman spectra, rule of mutual exclusion- CO₂ molecule.</p>	
UNIT II	2.0 CHEMICAL THERMODYNAMICS	10 L
	<p>2.1.1 Colligative properties: Vapour pressure and relative lowering of vapour pressure. Measurement of lowering of vapour pressure - Static and Dynamic method.</p>	
	<p>2.1.2 Solutions of Solid in Liquid: 2.1.2.1 Elevation in boiling point of a solution, thermodynamic derivation relating elevation in boiling point of the solution and molar mass of non-volatile solute.</p>	

	2.1.2.2 Depression in freezing point of a solution, thermodynamic derivation relating the depression in the freezing point of a solution and the molar mass of the non-volatile solute. Beckmann Method and Rast Method.	
	2.1.3 Osmotic Pressure : Introduction, thermodynamic derivation of Van't Hoff equation, Van't Hoff Factor. Measurement of Osmotic Pressure - Berkeley and Hartley's Method, Reverse Osmosis.	
	2.2 CHEMICAL KINETICS	5 L
	2.2.1 Collision theory of reaction rates : Application of collision theory to 1. Unimolecular reaction Lindemann theory and 2. Bimolecular reaction. (derivation expected for both) 2.2.2 Classification of reactions as slow, fast and ultra -fast. Study of kinetics of fast reactions by Stop flow method and Flash photolysis (No derivation expected).	

References

1. Physical Chemistry, Ira Levine, 5th Edition, 2002 Tata McGraw Hill Publishing Co.Ltd.
2. Physical Chemistry, P.C. Rakshit, 6th Edition, 2001, Sarat Book Distributors, Kolkota.
3. Physical Chemistry, R.J. Silbey, & R.A. Alberty, 3rd edition , John Wiley & Sons, Inc [part 1]
4. Physical Chemistry, G. Castellan, 3rd edition, 5th Reprint, 1995 Narosa Publishing House.
6. Fundamental of Molecular Spectroscopy, 4th Edn., Colin N Banwell and Elaine M McCash Tata McGraw Hill Publishing Co. Ltd. New Delhi, 2008.
7. Physical Chemistry, G.M. Barrow, 6th Edition, Tata McGraw Hill Publishing Co. Ltd. New Delhi.
8. The Elements of Physical Chemistry, P.W. Atkins, 2nd Edition, Oxford Universtity Press Oxford.
9. Physical Chemistry, G.K. Vemullapallie, 1997, Prentice Hall of India, Pvt.Ltd. New Delhi.
10. Principles of Physical Chemistry B.R. Puri, L.R. Sharma, M.S. Pathania, VISHAL PUBLISHING Company, 2008.

T.Y.B.Sc Physical Chemistry Practical

SEMESTER V

PHYSICAL CHEMISTRY

Non-Instrumental

Chemical Kinetics

To determine the order between $K_2S_2O_8$ and KI by fractional change method.

Instrumental

Potentiometry

To determine the solubility product and solubility of AgCl potentiometrically using chemical cell.

pH-metry

To determine acidic and basic dissociation constants of amino acid and hence to calculate isoelectric point.

Reference books

1. Practical Physical Chemistry 3rd edition A. M. James and F.E. Prichard , Longman publication
2. Experiments in Physical Chemistry R.C. Das and B. Behra, Tata Mc Graw Hill
3. Experimental Physical Chemistry By V. D. Athawale.

SEMESTER VI

PHYSICAL CHEMISTRY

COURSE CODE: USCH601

CREDITS: 01

LECTURES: 30

UNIT I	1.1 ELECTROCHEMISTRY	7L
	1.1.1 Activity and Activity Coefficient: Lewis concept, ionic strength, Mean ionic activity and mean ionic activity coefficient of an electrolyte, expression for activities of electrolytes. Debye-Huckel limiting law (No derivation).	
	1.1.2 Classification of cells: Chemical cells and Concentration cells. Chemical cells with and without transference, Electrode Concentration cells, Electrolyte concentration cells with and without transference (derivations are expected),	
	1.2 APPLIED ELECTROCHEMISTRY	8L
	1.2.1 Polarization: concentration polarization and its elimination	
	1.2.2 Decomposition Potential and Overvoltage : Introduction, experimental determination of decomposition potential, factors affecting decomposition potential. Tafel's equation for hydrogen overvoltage, experimental determination of over-voltage	
UNIT II	2.0 POLYMERS	15L
	2.1 Basic terms : macromolecule, monomer, repeat unit, degree of polymerization.	
	2.2. Classification of polymers: Classification based on source, structure, thermal response and physical properties.	
	2.3. Molar masses of polymers: Number average, Weight average, Viscosity average molar mass, Monodispersity and Polydispersity	
	2.4. Method of determining molar masses of polymers : Viscosity method using Ostwald Viscometer. (derivation expected)	
	2.5. Light Emitting Polymers : Introduction, Characteristics, Method of preparation and applications.	
	2.6. Antioxidants and Stabilizers : Antioxidants , Ultraviolet stabilizers, Colourants, Antistatic agents and Curing agents.	

Note : Numericals and Word Problems are Expected from All Units

Reference Books :

1. Physical Chemistry, Ira Levine, 5th Edition, 2002 Tata McGraw Hill Publishing Co.Ltd.
2. Physical Chemistry, P.C. Rakshit, 6th Edition, 2001, Sarat Book Distributors, Kolkota.
3. Physical Chemistry, R.J. Silbey, & R.A. Alberty, 3rd edition , John Wiley & Sons, Inc [part 1]
4. Physical Chemistry, G. Castellan, 3rd edition, 5th Reprint, 1995 Narosa Publishing House.
5. Modern Electrochemistry, J.O.M Bockris & A.K.N. Reddy, Maria Gamboa – Aldeco 2nd Edition, 1st Indian reprint,2006 Springer
7. Physical Chemistry, G.M. Barrow, 6th Edition, Tata McGraw Hill Publishing Co. Ltd. New Delhi.
8. The Elements of Physical Chemistry, P.W. Atkins, 2nd Edition, Oxford Universtity Press Oxford.
9. Physical Chemistry, G.K. Vemullapallie, 1997, Prentice Hall of India, Pvt.Ltd. New Delhi.
10. Principles of Physical Chemistry B.R. Puri, L.R. Sharma, M.S. Pathania, VISHAL PUBLISHING Company, 2008.
11. Textbook of Polymer Science, Fred W Bilmeyer, John Wiley & Sons (Asia) Ple. Ltd., Singapore, 2007.
12. Polymer Science, V.R. Gowariker, N.V. Viswanathan, Jayadev Sreedhar, New Age International (P) Ltd., Publishers, 2005.

T.Y.B.Sc Physical Chemistry Practical

SEMESTER VI

PHYSICAL CHEMISTRY

COURSE CODE: USCHP04

CREDITS: 01

Non-Instrumental

Viscosity

To determine the molecular weight of high polymer polyvinyl alcohol (PVA) by viscosity measurement.

Instrumental

Potentiometry

To determine the number of electrons in the redox reaction between ferrous ammonium sulphate and ceric sulphate potentiometrically.

Colorimetry

To estimate the amount of Fe(III) in the complex formation with salicylic acid by Static Method.

Reference books

1. Practical Physical Chemistry 3rd edition A.M.James and F.E. Prichard , Longman publication
2. Experiments in Physical Chemistry R.C. Das and B. Behra, Tata Mc Graw Hill
3. Experimental Physical Chemistry By V.D.Athawale.