



Devrukh Shikshan Prasarak Mandal's
Nya. Tatyasaheb Athalye Arts, Ved. S.R. Sapre Commerce and
Vid. Dadasaheb Pitre Science College
(Autonomous)

Late Kakasaheb Pandit Educational Campus,
Devrukh, Dist: Ratnagiri- 415 804, Maharashtra

NAAC Accredited 'A' Grade (Third Cycle), Mumbai University Best College Award 2009-10

Syllabus

Programme: T. Y. B. Sc.

Course- Physical Chemistry

w.e.f. Academic Year 2021-22

Choice Based Credit System
T. Y. B. Sc.
Chemistry Syllabus
To be implemented from the Academic year 2021-22

Course Content

Semester VI

Course Code	Unit	Topics	Credits	L/Week
USCHT61	I	Chemical Thermodynamics & Chemical Kinetics		
	II	Polymers & Renewable Sources		
	III	Quantum Chemistry & Applied Electrochemistry		
	IV	NMR & ESR Spectroscopy		
USCHT62	I	Coordination Chemistry		
	II	Properties of Coordination Compounds		
	III	Organometallic Chemistry		
	IV	Some Selected Topics		
USCHT63	I	Stereochemistry & Biomolecules		
	II	Molecular Rearrangements & Carbohydrates		
	III	Spectroscopy-II		
	IV	Polymers; Catalysts & Reagents		
USCHT64	I	Electro Analytical Techniques		
	II	Methods of Separation-II & Introduction to Quality		
	III	Food and Cosmetics Analysis		
	IV	Thermal Methods and Analytical Method Validation		
USCHP61		Chemistry Practicals I		
USCHP62		Chemistry Practicals II		
USCHP63		Chemistry Practicals III		
USCHP64		Chemistry Practicals IV		

T.Y.B.Sc. Syllabus Chemistry Paper-I
Physical Chemistry

Semester VI

Unit I: CHEMICAL THERMODYNAMICS & CHEMICAL KINETICS (15L)

1.1 Chemical Thermodynamics (10L)

1.1.1 Colligative Properties: Vapour pressure and relative lowering of vapour pressure. Measurement of lowering of vapour pressure- Static and Dynamic method.

1.1.2 Solutions of Solid in Liquid

1.1.3 Elevation in boiling point of a solution, thermodynamic derivation relating elevation in boiling point of the solution and molar mass of non-volatile solute. 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.

1.1.4 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.

1.2 Chemical Kinetics (5L)

1.2.1 Classification of reactions Collision theory of reaction rates: Application of collision theory to Unimolecular reaction (Lindemann theory) and Bimolecular reaction (Derivations expected)

1.2.2 Third law of Thermodynamics

1.2.3 Classification as slow, fast and ultra-fast. Study of kinetics of fast reactions by Stop Flow Method and Flash Photolysis (Derivation not expected).

Unit II: POLYMERS & RENEWABLE SOURCES (15L)

2.1 Polymers (10L)

2.1.1 Basic terms: macromolecule, monomer, repeat unit, degree of polymerization.

2.1.2. Classification of polymers: Classification based on source, structure, thermal response and physical properties.

2.1.3 Molar masses of polymers: Number average, Weight average, Viscosity average molar mass, Monodispersity and Polydispersity

2.1.4 Method of determining molar masses of polymers: Viscosity method using Ostwald Viscometer (Derivation expected)

2.1.5 Light Emitting Polymers: Introduction, Characteristics, Method of preparation and applications.

2.1.6 Antioxidants and Stabilizers: Antioxidants, Ultraviolet stabilizers, Colorants, Antistatic agents and Curing agents.

2.2 Renewable Sources (5L)

2.2.1 Renewable energy resources: Introduction.

2.2.2 Solar energy: Solar cells, Photovoltaic effect, Differences between conductors, semiconductors, insulators and its band gap, Semiconductors as solar energy converters, Silicon solar cell

2.2.3 Hydrogen: Fuel of the future, production of hydrogen by direct electrolysis of water, advantages of hydrogen as a universal energy medium.

Unit III: QUANTUM CHEMISTRY & APPLIED ELECTROCHEMISTRY (15L)

3.1 Basics of Quantum Chemistry (10L)

3.1.1 Classical mechanics: Introduction, limitations of classical mechanics, Black body radiation, photoelectric effect, Compton effect.

3.1.2 Quantum mechanics: Introduction, Planck's theory of quantization, wave particle duality, de Broglie's equation, Heisenberg's uncertainty principle.

3.1.3 Progressive and standing waves- Introduction, boundary conditions, Schrodinger's time independent wave equation (Derivation not expected), interpretation and properties of wave function.

3.1.4 Quantum mechanics: State function and its significance, Concept of operators - definition, addition, subtraction and multiplication of operators, commutative and non - commutative operators, linear operator, Hamiltonian operator, Eigen function and Eigen value.

3.2 Applied Electrochemistry (5L)

3.2.1 Polarization: concentration polarization and its elimination

3.2.2 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 IV: NMR & ESR SPECTROSCOPY (15L)

4.1 NMR -Nuclear Magnetic Resonance Spectroscopy (7L)

4.1.1 Principle: Nuclear spin, magnetic moment, nuclear 'g' factor, energy levels, Larmor precession, Relaxation processes in NMR (spin-spin relaxation and spin-lattice relaxation). Instrumentation: NMR Spectrometer

4.2 Electron Spin Resonance Spectroscopy (8L)

4.2.1 Principle: fundamental equation, g-value -dimensionless constant or electron g-factor, hyperfine splitting. Instrumentation: ESR spectrometer, ESR spectrum of hydrogen and deuterium.

(Numericals are expected from All Units)

Reference Books:

Physical Chemistry

1. Physical Chemistry, Ira Levine, 5th Edition, 2002 Tata McGraw Hill Publishing Co.Ltd.
2. The Elements of Physical Chemistry, P.W. Atkins, Oxford University Press, Oxford..
3. Modern Electrochemistry, J.O.M Bockris& A.K.N. Reddy, Maria Gamboa – Aldeco 2nd Edition, 1st Indian reprint,2006 Springer
4. Physical Chemistry, G.M. Barrow, 6th Edition, Tata McGraw Hill Publishing Co. Ltd. New Delhi.
5. The Elements of Physical Chemistry, P.W. Atkins, 2nd Edition, Oxford University Press Oxford
6. Physical Chemistry, G.K. Vemullapallie, 1997, Prentice Hall of India, Pvt.Ltd. New Delhi.