



MANNAR THIRUMALAI NAICKER COLLEGE (Autonomous)
DEPARTMENT OF PHYSICS
Course Structure – Semester wise CBCS (w.e.f.2020-2021)

Class : B.Sc (Physics)
Semester : V
Sub code : 18UCHA51

Part III : Allied
Hours : 4/week
Credits : 03

ALLIED CHEMISTRY – III
PHYSICAL CHEMISTRY

Course Outcomes:

After completion of this course, the student will be able to

CO1: mention and outline the concepts behind the reactions in gases, solutions and solids.

(K1 & K2)

CO2: determine mechanism of a reaction. (K3)

CO3: distinguish electrochemical, catalytic and thermodynamic transformations and can illustrate their scope to wider areas.(K4)

CO4: justify various chemical processes taking place in all the three phases.(K5)

CO5: predict the feasibility and rate of reactions occurring in solids, solutions and gases.(K6)

Unit I: Gaseous State

Gaseous state – Postulates of Kinetic theory of gases – derivation of expression for pressure of an ideal gas on the basis of Kinetic theory – deducing the basic gas laws- Deviation of real gases from ideal behaviour – reasons for deviation – derivation of vander Waal's equation.

Average, root mean square and most probable velocities – (equations only) relationship between these different velocities - Liquefaction of gases: Joule Thomson effect – Inversion temperature- Modern methods.

Unit II: Electrolytes and Electrochemistry

Arrhenius theory of electrolytes – strong electrolytes – weak electrolytes – Ostwald's dilution law and its applications – ionic product of water and its application - solubility product.

pH – definition – simple calculation of pH from molarity of acids and bases – buffer solution – definition – theory of buffer action- application- Acid –base indicators – working range of indicators – choice of indicators.

Commercial cells – primary and secondary cells – Weston cadmium cell – Lead storage cell – Electroplating - applications.

Unit III: Colloids

Colloidal state of matter – various types – classification - Sols – colligative properties- lowering of vapour pressure- elevation of boiling point- depression of freezing point– Osmotic pressure- Dialysis – electro osmosis – electrophoresis - stability of colloids – protective action – Hardy Schulze law – gold number-Emulsion: Types of emulsions-emulsifier with examples- Gels: Classification, preparation - Application of colloids.

Unit IV: Reaction Kinetics

Adsorption: Definition – differences between adsorption and absorption – adsorbate, adsorbent – types of adsorption – factors influencing adsorption- Adsorption isotherm – Langmuir isotherm (no derivation statement only) – adsorption of gases on solid surface.

Catalysis: Definition – characteristics - types – acid- base catalysis – surface catalysed reactions – definition and examples – auto catalyst – catalytic poisoning – promoters- Enzyme catalysis enzyme catalysis Michaelis and Menton mechanism – Line weaver-Burk plot – Significance of K_m .

Chemical Kinetics: Reaction rate –order and molecularity of a reaction – zero order – first order. First order rate equation and half-life period – derivation-units- Examples of first order reactions – second order reactions – Carbon dating.

Unit V: Thermodynamics

Importance of thermodynamics – terms used in thermodynamics – open and closed systems, state functions and path functions, extensive and intensive properties, reversible and irreversible processes- Statement and mathematical form of first law of thermodynamics – heat capacity at constant volume and pressure, relation between C_p and C_v .

Statement of second law of thermodynamics – entropy - entropy as a thermodynamic function – dependence of entropy on variables of the system (T and P alone)- Physical significance of entropy – Gibb's free energy and its significance.

Text books:

1. Arun Bahl, B.S Bahl & G.D. Tuli, Essentials of Physical Chemistry, S.Chand and Co, New Delhi, 2014.
2. B.R. Puri, L.R. Sharma and S.Pathania, Principles of Physical Chemistry, Shoban Lal Nagin chand and Co, 47th edition, 2017.

References:

1. KL Kapoor, Textbook of Physical Chemistry, Vol 2, Macmillan, 2000.
2. Gilbert. W. Castellan, Physical Chemistry, Narosa publishing house, third edition 1985.
3. P.W. Atkins, Physical Chemistry, 7th edition, Oxford university press, 2001.



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DEPARTMENT OF PHYSICS
Course Structure – Semester wise CBCS (w.e.f.2020-2021)

Class : B.Sc (Physics)
Semester : VI
Sub code : 18UCHA61

Part III : Allied
Hours : 4/week
Credits : 03

ALLIED CHEMISTRY - IV
APPLIED AND ANALYTICAL CHEMISTRY

Course Outcomes:

After completion of this course, the student will be able to

CO1: describe processes involved in extraction and manufacture of natural and synthetic compounds. (K1)

CO2: explain the techniques of separation of natural and synthetic compounds (K2)

CO3: identify a suitable method of synthesis and purification of a specific compound. (K3)

CO4: examine the analytical data and can identify the type of molecule present. (K4)

CO5: appreciate the application of various compounds in daily life. (K5)

Unit I: Water technology

Water – Hardness of water – types of hardness – removal of hardness – Deionisation process, Zeolite process, Reverse osmosis - Industrial implications of hardness of water – estimation of hardness by EDTA Method – Units of hardness of water.

Industrial waste water- Health and Environment Concerns in waste water management – Constituents in waste water inorganic – Organic and metallic constituents- basic ideas of waste water treatment

Unit II: Spectroscopy

Basic principles of UV and IR spectroscopy – identification of simple organic molecules (ethanol and dimethyl ether, acetaldehyde and acetone, ethylene and acetylene, cis-2-butene and trans-2-butene, methylamine, dimethylamine and trimethylamine)

Proton NMR spectroscopy – Principle – Instrumentation – Chemical shift – Spectrum of ethanol.

Unit III: Chromatography

Chromatographic techniques: Principle and application-partition and adsorption chromatography - Thin layer chromatography - Column chromatography – Normal phase and Reverse phase liquid chromatography, Development of HPLC and UPLC method, Choice of stationary and mobile phase, Difference between HPLC and UPLC, Applications- Paper chromatography- Gas - solid and gas-liquid chromatography.

Unit IV: Polymers

Definition – Classification of polymers – properties of polymers – addition and condensation polymerization reactions with examples – natural rubber – isoprene unit –vulcanization of rubber- preparation and applications of polystyrene, urea – formaldehyde resin, Teflon and buna – S - rubber.

Amino Acids and Proteins, Classification, Synthesis, Properties of amino acids- Polypeptides, Proteins, Classification and biological functions.

Unit V: Photochemistry

Comparison of thermal and photochemical reactions – definition of photochemical reactions – laws of photochemistry – Grotthus – Draper law- Quantum efficiency – reasons for low and high quantum yields with examples.

Consequences of light absorption by atoms and molecules- Jablonski diagram – fluorescence – phosphorescence – photosensitization- chemiluminescence–bioluminescence- Applications of photochemistry.

Text books:

1. Guldeep R. Chatwal and Shank K. Anand, Instrumental Methods of Chemical Analysis, Himalaya Publishing House, Mumbai, 2008.
2. R. Gopalan, Analytical Chemistry, S. Chand & Co., New Delhi, 2004.I.L. Finar Organic Chemistry vol 2 (3rd.ed.) Longmans Green & Co. 1964

References:

1. B.R. Puri, L.R. Sharma and S.Pathania, Principles of Physical Chemistry, Shoban Lal Nagin chand and Co, 47th edition, 2017.
2. Polymer Science, Vasant R. Gowariker, N. V. Viswanathan, Jayadev Sreedhar, New Age International, 1986.
3. Jain & Jain, Engineering Chemistry, Dhanpat Rai & Sons.



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Course Structure – Semester wise CBCS (w.e.f.2020-2021)

ALLIED CHEMISTRY PRACTICAL - II
ORGANIC ANALYSIS PRACTICAL

Class : B.Sc (Physics)
Semester : V&VI
Subject Code : 18UCHAP2

Part III : Allied
Hours : 2/week
Credits : 02

Course Outcomes

After completion of this course, the students will be able to

- CO1:** list the elements present in organic compounds. (K1)
- CO2:** explain the reactions of organic compounds. (K2)
- CO3:** identify the functional groups present. (K3)
- CO4:** distinguish properties of functional groups of same element. (K4)
- CO5:** defend their results using confirmatory test.(K5)

A study of reactions of the following organic compounds:

1. Carbohydrate
2. Amide
3. Aldehyde
4. Ketone
5. Monocarboxylic acid
6. Dicarboxylic acid
7. Amine
8. Phenol
9. Nitro compound

The students may be trained to perform the specific reaction like test for element (nitrogen only), Aliphatic or aromatic, saturated or unsaturated, color reaction, functional group present and record their observation.