

UNIVERSITY OF MADRAS
U.G. DEGREE COURSES
SYLLABUS WITH EFFECT FROM 2020-2021

BCY-CSA1A

ALLIED CHEMISTRY - I
(For Maths and Physics Students)
(60 Hours) 4 Credits

Learning Outcome

1. To know the fundamentals of Nuclear Chemistry
2. To understand the industrial application of Fuels, Fertilizers and Polymers
3. To understand the basic concepts of Organic Chemistry
4. To study the various laws of Thermodynamics
5. To learn the fundamentals of Chemical Kinetics and basics of Photochemistry

Unit I: NUCLEAR CHEMISTRY **(10 Hours)**

Fundamental particles of nucleus, isobars, isotones and isomers - Differences between chemical reactions; fusion and fission - Radioactive series, group displacement law - Mass defect, derivation of $1\text{amu} = 931\text{ MeV}$ - nuclear binding energy and calculation - Applications of radio isotopes - carbon dating and in medicine.

Unit II: INDUSTRIAL CHEMISTRY **(15 Hours)**

Fuels- Classification-gaseous fuels like water gas, producer gas, liquefied petroleum gas, gobar gas, compressed natural gas – Fertilizers - Classification - urea, Ammonium sulphate, superphosphate, Triple super phosphate, potassium nitrate- manufacture and uses - Silicones - Preparation, properties and applications. Hardness of water: temporary and permanent hardness, disadvantages of hard water -Softening of hard water - Zeolite process, demineralization process and reverse osmosis - Purification of water for domestic use: use of chlorine, ozone and UV light - definition and determinations of BOD and COD. Polymers: General method of preparation and properties of the following: PVC, Polyethylene, Teflon, Bakelite, Nylon 6 and Nylon6,6.

Unit III: FUNDAMENTALS OF ORGANIC Chemistry **(10 Hours)**

Classification of organic compounds -Hybridization in methane, ethane, ethylene, acetylene, benzene - classification of reagents - electrophiles, nucleophiles and free radicals - Classification of reactions- addition, substitution, elimination and polymerisation.

Unit IV: THERMODYNAMICS **(10 Hours)**

Definition of certain terms - system, surrounding, reversible and irreversible processes - Limitations of I law , Need for II Law - Different Statements of II. Law - Carnot cycle - Efficiency - Carnot Theorem - Thermodynamic Scale of Temperature - Entropy- Definition, Unit and change of entropy for phase transformation, Free energy - nature of process in terms of free energy and entropy-Statement of Third Law.

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Unit V: CHEMICAL KINETICS AND PHOTOCHEMISTRY (15 Hours)

Rate of chemical reaction- Differential rate expression - order and molecularity - Integrated rate expression for first and second, order reactions (same concentration of reactants only)- Half-life period- Effect of temperature on rate - Activation energy . Arrhenius equation - Homogeneous and heterogeneous catalysis. Photochemistry - Statement of Grotthus-Draper Law, Stark-Einstein's Law, Quantum Yield. Hydrogen chlorine reaction (elementary idea only) Photosynthesis, Photosensitisation, Phosphorescence Fluorescence, Chemiluminescence- Definition with examples.

BOOKS FOR REFERENCE

1. Gopalan R. and Sundaram S., Allied Chemistry, Sultan Chand & Sons Publishers, New Delhi 2nd ed.
2. Soni P.L. and Mohan Katyal, Text Book of Inorganic Chemistry, Sultan Chand and Company Pvt. Ltd, New Delhi, 20th ed.
3. Bahl B.S. and Arun Bahl, A text book of Organic Chemistry 21st ed., S. Chand and Company Pvt. Ltd.