M.Sc. Semester -IV
Physical Chemistry
CHNN-704(P)
Paper-IV

Unit 1: Chemistry of Nanomaterial's **25% (15 Hours)**

Classification and nomenclature of nanomaterials: Nanosized metals and alloys, semiconductors, Organic semiconductors, Carbon materials; Zero-, One, Two and Three dimensional nanostructures-Quantum dots, Quantum wells, Quantum rods, Quantum wires, Quantum rings; Synthesis of nanomaterials (Nucleation and growth of nano systems; self-assembly, mechanical Milling, Chemical reduction and oxidation, Hydrothermal, Micelles, Sol-Gel processes, photolysis, radiolysis) Designing of advanced integrated nano-composites, fundamental properties (Size effects on structure and morphology of free or supported nano particles, size and confinement effects), applications of nano materials.

Unit 2: Green Chemistry **25% (15 Hours)**

Need for Green Chemistry, Goals of green chemistry, Limitations/obstacles in pursuit of the goals of green chemistry, green chemistry in sustainable development. Twelve principles of green chemistry with their explanation and examples; designing a green synthesis using these principles, immobilized solvents and ionic liquids; energy requirements for reactions like use of microwaves, ultrasonic energy; green synthesis of adipic acid, catechol, ibuprofen, paracetamol, BHT. Microwave assisted reactions in water (Hofmann elimination, Hydrolysis of benzyl chloride, Benzamide), Ultrasound assisted reactions in water (Esterification, saponification, substation reactions, alkylation, oxidation, reduction)

Unit 3: Nuclear Chemistry-1 **25% (15 Hours)**

Introduction. Atomic structure, Isotopes, Isomers, Isobars, Isotones.

Nuclear reaction, Nuclear stability, Mass spectrograph, Thomson's parabola method, Aston's Dempster's, Bainbridge Neir's Nuclear reactions classifications, Q-values equation and calculations, Cross-sections and its determination, High energy reactions, Direct nuclear reactions, Photo nuclear reactions, Thermo nuclear reactions, Nuclear radio activity: α,β,Υ rays, Decay schemes, Group displacement rules, Mechanism of radioactive decay, GEIGER-

NUTTALS RULE, Rate of nuclear disintegration, Radioactive equilibrium and its types, Cyclotron, Synchrotron, Linear accelerator.

Unit 4: Nuclear Chemistry-2 **25% (15 Hours)**

Methods of artificial disintegration, Nuclear fission and nuclear fusion, Atomic bomb, Hydrogen bomb, Nuclear Models: Shell Model (periodicity, properties, magic number nuclear configuration), liquid drop model and semi empirical equation, fermi gas model, collective model.

Synthesis of radio isotopes of Na and C

Application of Radio isotopes: Chemical investigations, age determination, Medicinal applications, analytical applications and industrial applications.

Books:

1. Klabunde K.J.(Ed.), "Nanoscale materials in chemistry ", John Wiley &sons Inc. 2001
2. Nalwa, H.S.(Ed.), "Encyclopedia of nanoscience and nanotechnology" 2004
3. Sergeev, G.B. Nano chemistry, Elsevier, B.V. 2010
4. Schmid, G. (Ed.) "Nanoparticles", Wiley-VCH Verlag GmbH & co. KgaA. 2004
5. Rao, C.N.R., Muller, A. and Cheentham, A.K(Eds), "Chemistry of nanomaterials" , Wiley-VCH, 2005 NSC
6. V.K. Ahluwalia & M.R. Kidwai: New trends in Green chemistry, Anamalaya publications (2005)
7. Advanced physical Chemistry By Gurdeep Raj.
8. Principle of Physical Chemistry by Puri Sharma Pathania
9. Nuclear Chemistry By C .V Shekar