**Subject Code : ECN1BA**

## ELECTIVE COURSE I – INORGANIC CHEMISTRY I

### Unit I

Acids and Bases : Bronsted and Lewis acids and bases, pH, pKa, acid – base concept in non-aqueous media, buffer solution, Protonic Acis – Proton Affinities – Differentiating and leveling Solvents – Acidic Behaviour of the Binary hydrides – strength of oxyacids – Hydrolysis – Amphoteric oxides – Non protonic Concepts of Acid – Base Reactions – Lux concept – Solvent Ion theory of Acids and Bases – Liquid Ammonia, Acetic acid, bromine trifluoride, Dinitrogen tetroxide, liquid hydrogen fluoride as solvents – Classification of Acids and Bases as Hard or Soft – Acid – Base strength and Hardness and softness – Symbiosis – Theoretical basis of Hardness and Softness – Electronegativity and Hardness and Softness.

### Unit II

**Ionic Bond, Crystal structure and Advanced Covalent Bonding :**

Radius Ratio rules – calculation of some limiting radius ration values for C.N.3 (plannar triangle), C.N.4(tetrahedral), C.N.6 (octahedral).

**Classification of Inoic Structures :**

AX, $AX_2$, $AX_3$ types. AX type (ZnS, NaCI, CaCI) structures only. $AX_2$ type, fluorite, rutile, beta crystobalite (structure only). Layer structure – $CdI_2$ Nickel arsenide structures – lattice energy – Born Lande equation derivation – important points arising from Born Lande equation – Schottky defect and Frenkel defect – explanation and calculation of number of defects from $cm^3$ – metal excess defect – F Centers and interstitial ions – Metal deficiency defect – positive ions absent – extra interstitial negative ions – Band theory of solids – insulators, semiconductors and superconductors. Transistors Recetifiers – Photovotaic cell – Qualitative molecular orbital theory, Walsh Diagrams – Symmetry of orbitals.

### Unit III

**Nuclear Chemistry :**

Radioactive decay – Theories of decay processes – Laws of radioactivity – Detection and Measurements of radiations – Nuclear structure – Composition of nuclei – properties of nuclei – nuclear radii- nuclear spin etc. – nuclear forces - its characteristics – Meson Field theory – nuclear stability – nuclear models – liquis drop, shell and collective models.

**Artificial Radioactivity :**

Nuclear reactions – transmutation – Stripping and pick up, Fission products and fission yields, fusion, spallation and fragmentation reactions scattering reactions – nuclear cross section – Q – value Nuclear reactors – charged particle accelerators – neutron sources – gamma ray and X-ray sources.

Radioactive techniques – tracer technique neutron activation and isotopic dilution analysis, counting techniques such as G.M. ionization and proportional counter.

Applications of nuclear science in agriculture and biology.
Radiation risks and medical benefits – Natural and manmade isotopes

**Unit IV**

**Polyacid anions :**

Basic building units of vanadate, molybdate, an tungstate ions – apex sharing (structure only) – Heteropoly anions – structure only.

**Rings :** Phosphazenes – structure – Craig and Paddock model – Dewar model
Cages of phosphorus – Boron hydrides and carboranes

**Clusters :**
Metal clusters – dinuclear clusters – structure of $Re_2CI_8$ – Qualitative M.O. diagrams for dinuclar rhenium and molybdenum complexes to explain the strength of quadrupole bond – Cluster bonding models – Wade and Luhar.

**Unit V**

**Chemistry of Metals and Rare gases :**
General properties of metals, occurrence, principles of isolation and complex formation of s, p and d block metals, Chemistry of lanthanides and actinides- Spectral and Magnetic properties, lanthanide contraction.
Rare Gas : Isolation, Chemistry and structure of rare gas compounds (Xenon Compounds)

**References:**


1. Badie E.Duglas and Danl H.McDaniel. Concepts and Models in Inorganic Chemistry, Indian Edition, 1970, Oxford and IBH Publishing Co., New Delhi.
2. J.D.Lee, A New concise Inorganic Chemistry, 4th Edition, ELBS, 1995 (UNIT – II)
3. G.Friedlander, J.w. Kennedy and J.M. Miller, Nuclear and Radiochemistry (Unit III)
4. Keith F.Purchell and John. C.Kotz, Inorganic Chemistry, Saunders Golden Sunburst series, W.B. Saunders Company, Philadelphia.
5. Cotton and Wilkinson, Advanced Inorganic Chemistry, 5th Edition, John Wiley & sons, New York (Unit IV)
6. W.Kain and B.Schwederski, Bioinorganic Chemistry, Inorganic Elements in the Chemistry of Life, John Wiley and Sons, New York (Unit V)
7. James E.Huheey, Ellen A.Keiter and Richard L.Keiter, Inorganic Chemistry : Principles of structure and Reactivity, 4th Edition, Addison – Wesley, New York, (Unit I)
8. Shriver and Atkins, Inorganic Chemistry, III Edition Oxford, 1999, India Gopsons PVT Ltd, A-14 Sector Noida.