Subject Code : N1B1

Paper I – Inorganic Chemistry – I

Unit IAcids and Bases :

Protonic acids – Proton Affinities – Differentiation and Leveling Solvents – Hammet Ho Scale – Acidic Behaviour of the binary Hydrides – Cosolvating agents - - Oxyacids – Organic acids – Acetic acid and the Inductive Effect, Aromatic Acids and Resonance Effects – Hydrolysis and Aquoacids – Basic precipitations – Amphoteric oxides – Nonprotonic Concepts concepts of Acid – Base Reactions – Lux Concept – Solvent Ion Theory of Acids and Bases – Liquid Ammonia, Acetic acid as a solvent, Bromine trifloride, Binitrogen teroxide, Liquid hydrogen chrloride – Hard and Soft Acids and Bases – 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.

Inorganic Chains, Rings and Clusters :

Chains – Catenation, heterocatenation – silicate minerals (names and structures only) Intercalation chemistry – talc, muscovite (structure only).

Isopoly anions : - basic building units of vanadate, molybdate and tungstate ions – apek sharing (structure only) – Heteropoly anions – structure only.

Rings – Phosphazenes – structure – Craig and Paddock model – Dewar model.

Unit II Ionic Bond and Crystal structure :

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

Classification of Ionic structures – AX, AX2, AX3 types, AX type (ZnS, NaCL, CsCL) Structures only, AX2 type, fluorite, rutile, beta-cristobalite, (structure only). Layer structure – CdI2, 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 form per cm3 – Metal excess defect – F centers and interstitial ions – Metal deficiency defect – positive ions absent – extra interstitial negative ions – Semiconductors and transistors – Rectifiers – Photovoltaic cell – Transistors – steps in the manufacture of memory chips for computers.

Unit III Nuclear Chemistry :

Radioactive decay – Theories of decay processes – Laws of radioactivity – Detection and measurement of radiations – Nuclear structure – Composition of nuclei – properties of nuclei – nuclear radii, nuclear spin etc, - nuclear forces –

its characteristics – Meson field theory – nuclear stability – characteristics – Meson field theory – nuclear stability – nuclear models – liquid drop, shell and collective models.

Artificial radioactivity – Nuclear reactions – transmutations, stripping and pick up, fission, fusion, spallation and fragmentation reactions – scattering reactions – nuclear cross section.

Nuclear reactors – charged particle accelerators – neutron sources – gamma ray and X-ray sources. Applications of nuclear science in agriculture and biology – neutron activation and isotopic dilution analysis.

Unit IV Medicinal Bioinorganic Chemistry

Bioinorganic chemistry of toxic metals – lead, cadmium, mercury, aluminium, chromium, iron, copper, plutonium. Detoxification by metal chelation – Drugs which act by binding the metal sites of metalloenzymes.
Radiation risks and medical benefits – Natural and manmade radio isotopes – Bioinorganic chemistry or radiopharmaceuticals – Technetium.

Unit V Extraction and uses of metals

Metallurgy of Zr, Ge, Be, Th – Preparation and uses of their important compounds. Metal clusters – Dinuclear clusters – structure of Re2C18. – Qualitative M.O. diagrams for dinuclear rhenium and molybdenum complexes to explain the strength of quadraupole bond.

Reference:

1. Bodie E.Douglas and Darl H.McDaniel, Concepts and Models in Inorganic Chemistry, Indian Edition, 1970, Oxford & IBH Publishing Co, New Delhi, (Unit I).
2. J.D. Lee, A New concise Inorganic Chemistry, 4th edition, ELBS, 1995 (Unit II).
3. G.Friedlander, J.W. Kennady and J.M. Miller, Nuclear and Radiochemistry (Unit III).
4. Keith F.Purchell and John c.Kotz, Inorganic Chemistry, Saunders goldern Sunburst Series, W.B. Saunders Company, Philadelphia (Unit IV).
5. Cotton and Wilkinson, Advanced Inorganic Chemistry, 5th ed., John Wiley & Sons, New York (Unit V).
6. W.Kain and B.Schwederski, Bioinorganic Chemistry, Inorganic elements in the Chemistry of Life, John Wiley & Sons, New York (Unit IV).
7. James E.Huheey, Ellen A Keiter and Richard L.Keiter, Inorganic Chemistry : Principles of Structures and Reactivity, 4th ed., Addison-Wesley, New York. (Unit I and V).