

CORE COURSE VI – GENERAL CHEMISTRY IV

Unit I: Metallurgy and d-Block elements

Occurrence of metals – concentration of ores – froth floatation, magnetic separation, calcinations, roasting, smelting, flux, aluminothermic process – purification of metals – electrolysis, zone refining, van Arkel de Boer methods – chemistry of transition elements – electronic configuration – general periodic trend – group study of titanium, vanadium, chromium, manganese and iron group's coinage metals - comparative study and chemistry of photography – comparative study of zinc group metals – galvanization, evidences for the existence of mercurous ion as Hg_2^{2+}

Unit II: Chemistry of f- Block Elements

General characteristics of f-block elements – comparative account of lanthanides and actinides – occurrence, oxidation states, magnetic properties, colour and spectra – lanthanides and actinides – separation by ion exchange and solvent extraction methods – lanthanide contraction – chemistry of thorium and uranium – occurrence, ores, extraction and uses – preparation, properties and uses of ceric ammonium sulphate, thorium dioxide, thorium nitrate, uranium hexafluoride, uranylacetate

Unit III: Chemistry of Organometallic compounds

Introduction – preparation of organo magnesium compounds – physical and chemical properties – uses – preparation of organozinc compounds – physical and chemical properties – uses preparation of organolithium compounds – physical and chemical properties – uses chemistry of organo copper, organolead, organophosphorus and organo boron compounds

Unit IV: Chemistry of Alcohols, Phenols and Ethers

Nomenclature – laboratory preparation of alcohols – industrial source of alcohols – physical properties – chemical properties – uses – chemistry of glycols and glycerols – uses – preparation of phenols including di and tri hydric phenols – physical and chemical properties – uses – aromatic electrophilic substitution mechanism – theory of orientation and reactivity, laboratory preparation of ethers, epoxides – physical properties – chemical properties – uses – introduction to crown ethers – structures – applications

Unit V: Chemical Kinetics and Catalysis

Rate of reaction, average and instantaneous rates, rate equation, order of reaction. Rate laws: rate constants – derivation of rate constants and characteristics for zero, first order, second and third order (equal initial concentration) – derivation of time for half change with examples. Methods of determination of order of reactions – experimental methods of determination of rate constant of a reaction – volumetry, manometry, polarimetry, Mechanism of complex reactions – equilibrium and steady state approximations.

Effect of temperature on reaction rate – concept of activation energy, energy barrier Arrhenius equation. Theories of reaction rates – collision theory –

derivation of rate constant of bimolecular gases reaction – failure of collision theory – Lindemann's theory of unimolecular reaction. Theory of absolute reaction rates – derivation of rate for a bimolecular reaction – significance of entropy and free energy of activation. Comparison of collision theory and ARRT. Kinetics of fast reaction – flow methods and pulse methods. Catalysis – homogeneous and heterogeneous – homogeneous catalysis – kinetic of acid – base and enzyme catalysis. Heterogeneous catalysis – adsorption – types – chemical and physical. Characteristics of adsorption. Different types of isotherms – Freundlich and Langmuir

Books for Reference:

1. Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry, (23rd edition), New Delhi, Shoban Lal Nagin Chand & Co., (1993)
2. Lee J.D. Concise Inorganic Chemistry, UK, Black well Science (2006)
3. Puri. B.R., Sharma L.R., Pathania M.S., Principles of Physical Chemistry (23rd edition) New Delhi, Shoban Lal, Nagin Chand & Co., (1993)
4. Glasstone S. Lewis D., Elements of Physical Chemistry, London, Mac Milan & Co.
5. Morrison R.T. and Boyd R.N., Organic Chemistry (6th edition), New York, Allyn & Bacon Ltd., (1976)
6. Bahl B.S. and Arun Bahl, Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (1997)