उ0प्र0 शिक्षा सेवा चयन आयोग, प्रयागराज।

Syllabus

Lecturer (PGT) - CHEMISTRY
(Subject Code- 02)

(A) Physical chemistry Gaseous-state: Molecular velocity of gases, mean free path and collision diameter, liquification of gases joule thomson effect in ideal and nonideal gases, Joule "Thomson coefficient, inversion temperature, Deviation from ideal gas behavior vander waals equation of state, Law of corresponding state, critical constants and their relations with-vander waals constants

Liquid state:- surface Tension, effect of temperature on surface tension, viscosity, effect of temperature and pressure on viscosity.

Solid State:- symmetry in crystal systems, Miller inclices, Bragg's Equation, close packing, coordination number, structure of Nacl and CaF2, crystal-defects.

Thermodynamics:- first law of thermodynamics and its limitations, enthalpies of a system, heat of reaction formation, combustion and neutralization. Hess's law and its application bond energy and resonance energy, heat capacities at constant volume and constant pressure, relationship between Cp and Cv, extensive and intensive properties, statement of second law of thermodynamics, Carnot cycle, concept of entropy, variation of entropy with temperature and volume/pressure, concept of free energy: Helmholtz and Gibbs free energies, Gibbs - Helmholtz equation, thermodynamic criteria of equilibrium, Clapeyron- clausius equation and its application, Chemical Potential and variation of chemical potential with temperature and pressure, van't hoff equation and Gibbs-Duhem equation.

Dilute solution:- Ideal and non ideal solutions, Raoult's Law colligative properties (thermodynamic treatment) Lowring of vapour pressure, osmotic pressure, elevation of boiling point and depression of freezing point in solution, abnormal colligative properties, molecular weight determination by colligative properties.

Surfacephenomenon- physical and chemical adsorption Fraundlich adsorption isotherm Langmuir state value Gold-number, Hardy-Schulze rule stability of collcids, zeta potential

Chemical Kinetics-Molecularity and order of reaction, rate of reaction Zero first second and third order reactions and their determination effect of temperature on reaction velocity, energy of activation, kinetic molecular theory of reaction rates; catalysis, criteria of catalysis, Theories of catalysis, enzyme catalysis, primary salt effect in ionic reactions.

Chemical equilibrium- Law of mass action and its application to homogeneous and heterogeneous equilibria, relationship between Kp and Kc. Le chateller principle and its application to chemical equilibrium, degree of dissociation and abnormal; rmolecular Weight hydrolysis of salts, Bronsted & lewis acid and base. pH, buffer solution, solubility and solubility Product of sparingly soluble salts.-

Electrochemistry- Electrolytic conductance-equivalent, specific and molecular fconductances, variation of conductances with dilution of solutions, Kohlausch's law of findependent migration of ions, factors affecting the conductances, types of single electrode and their potentials. EMF of the cell, Conductmetric and potentiometric titrations; Nernest equation. EMF and equilibrium constant, concept of concentration cell With anc without transference, liquid junction polential chemical cells without transference, fuel cells.

The electrical double layer, electro kinetic phenomena, quantitative treatment of electro osmosis, electrophoresis and streaming potential.

B-Inorganic: Chemistry-

Atomic structure- dual nature of particle, Heisenberg's uncertainity principla Schrodinger's wave equation for atomic orbitatals, quantum numbers, shapes of s.p.d. orbitals, Aufbau principle and pauli's expiusion principle, Hunds law, electronic configuration of elements, modern periodic table, periodic properties of the elements and their variation in periodic table, chemical bond- lonic bond, lattice energy, Born-Haber cycle, salvalion energy, Covalent bond (Fajan's rule) Bond order, energy level diagram, of homonuclear and heteronuclear molecules, Hybridisation and shapes of inorganic molecules and ions, valence shell electron pair repulsion theory and its application, stability of nucleus, mass defect and nuclear binding energy, radioactivity, nuclear reactions-fusion and fission, carbon dating.

s-block elements- chemistry of lithium and berilium, abnormal behavior and diagonal relationship. Polyether complexes of alkali and alkaline earth metals.

p-block elements- chemical reactivity of elements in group, inert pair effect, structure of their hydrides and halides, oxyacids of N, P, Sand halogens, interhalogens; Inorganic polymers: polyphosphazenes, thiazyl; Boranes and silicates

d-block elements: General characteristics- variable oxidation state, complex formation, magnetic properties, colour and catalytic properties,

coordination compounds-nomenclature, stereo chemistry of metal, complex and Isomerisation, effective atomic number and valence bond theory, crystal fleld theory, crystal field splitting in tetrahedral and Octahedral complexes, crystal field stabilization energy substitution reaction in square planar complexes; electronic spectrum, molecular orbital energy level diagram in tetrahedral and octahedrdal complexes (bond only) energy level diagram for d^1 and d^9 states.

Organometallic chemistry- Definition, nomenclature and classification of organometallic compounds; hapticity and polarity of metal corbon bond.

Bioinorganic chemistry- Structure and funraron of myoglobin Hemoglobin, chlorophyll and cyano cobalamine; zine enzymes, carboxypeptidase and carbonic anhydrase

f-block elements: Electronic structure, lanthanide contraction and its consequences, magnetic and spectral properties and their differences from transition metalsion exchange and solvent extraction methods of separation of tanthanides chemistry of actinides; kinetics and mechanism of substitution reaction in octahedral Co(II) and square planar Pt(II) complexes.

A-ORGANIC CHEMISTRY:-

1-ORGANIC CHEMISTRY- Some Basic Princes Techniques:-

(a) Classification of organic compounds

(b) IUPAC Nomenclature of organic compounded

(c) Types of organic reaction

(d) Mechanism of organic reaction- Homolytic & Hetrolytic fission of covalent Bond, generation and stability carbocations, carbanions free Radicals and benzyne.

(e) Electronic Displacements in covalent Bond Inductive effect, electrometric effect, Resonance, Hyper conjugation

(f) reaction mechanism of fallowing general reactions:

(i) SN1, and SN2 reactions

(ii) E1, E2 and E 1cb reaction

(iii) electrophilic addition of alkenes

(iv) Nucleophilic addition of carbonyl compounds

(v) acyl subtitution reaction of acid derivatives

(vi) electrophilic aromatic substitution reaction

(g) estimation of elements in organic compound,

2-Isomerism:-

structural & stereo Isomerism, (Geometrical & optical Isomerism) Tautomerism conformation

3-Hydrocarbon:-

a- General methods of preparation, chemical properties of Alkane, Alkene & Alkynes, Location of double bonds by ozonolysis of Alkene.

b-Aromatic Hydrocarbon:-

Aromaticity of benezenoid and non- benezenoid compound and ions.

Mechanism of electrophlic substitution- nitration, sulphonation, Halogenations, ferial craft's Alkylation & Acylation, Directive Influence of groups in mono substituted benzene. Carcinogenicity & (Toxicity chemistry of toluene)

c-Derivatives of Benzene:-

Preparation, & chemical properties of Phenol, Aniline, Anisole Benzaldehyde & Benzoic Acid

4-Haloalkanes:-

General Methods of preparation, physical and chemical properties preparation and properties of chloroform and landform, Freon

5. Alcohols: classification, General methods of preparation, Physical & chemical properties, mechanism, of dehydration of Alcohol, Denatured spirit, power alcohol, Absolute Alcohol fermentation of Alcohol Properties of Glycerol.

6. Aldehyde & Ketones:-

General Methods of preparation, Physical & chemical properties, nucleophilic addition of addehydes and ketenes with carbon, nitrogen, oxygen and sulphur nucleophiles.

7- Ether:- General methods of preparation of ether, physical & chemical Properties of Ether & uses

8-Carborxylic acid and their Derivatives:-

General Methods of preparation physical and properties, Influence of substituent group on acidic nature of carboxylic acid, General methods of preparation & properties of acid, Halide, ester, Amide, & Anhydride

9-Organic compounds containing nitrogen:-

a-Amines:-classification, general methods of preparation & properties, basicity of aliphatic amines and substituted anilines. Distinction between primary second and tertiary amines

b- Nitro Compounds:- General methods of preparation & properties of nitoro compounds. Reaction due to alpha-hydrogen of primary and secondary nitroalkanes.

c- Cyanides & Isocyanides:- General methods of preparation & properties cyanides & isocyanides.

d- Benzene diazonium chlori'de: preparation & properties and synthetic uses.

10-bio molecules:-

a- carbohydrates clasifition glucose & Fructose preparation & properties open and Ring structure of glucose maturation, Annomers.

b- Proteins Alpha Amino acids peptide bond, polypeptide, protein , structures of protein primary, secondary & tertiary, structure denaturation of proteins, zwitter ion, Iso electric points

c- **lipids and hormones**

oil and fats introduction, different between oil and fats properties.

steroids- natural and artificial steroid hormones- classification and function

d- **vitamins-** classification and functions deficiency diseases of vitamins

e- **nucleic acids-**

nucleotides and nucleosides, different between DNA and RNA primary structure of DNA

DNA fingerprinting.

11-polymers:- classification natural and synthetic polymers, methods of polymerization (addition & condensation) addition polymers- polythene, teflon PVC buna-s Buna-N condensation polymer-nylon 6, 6 back elite methyl melamine Biodegradable & non Biodegradable polymers.

12-Chemestry in every day life:-

a- chemical in medicine:- Analgesic, traquliquilizers, antiseptics, disinfectant antimicrobials antibiotics antacids, antihistamines, antioxidants

b- chemicals in foods; preservatives artifice sweetening agent,

c- cleansing agents-difference between soaps & detergents cleansing action of soap.

13-machanism of some name reaction:-

(i) Williamsons either synthesis

(ii) Addition of boranes with alkenes

(iii) Witting reaction

(iv) Perkin reaction

(v) Aldol addition

(vi) Cannizzaro addition

(vii) Michael addition

(viii) Reimer-Tiemann reaction

(ix) Benzoin condensation

(x) Diazonium coupling

(xi) Reformatsky reaction