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தேர்வில் சாதனை படைத்த மாணவர்கள்!

STUDENTS WHO ACHIEVED SUCCESS IN THE EXAM!

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CHEMISTRY

INORGANIC CHEMSTRY UNIT – I

A. ATOMIC STRUCTURE AND PERIODIC CLASSIFICATION

I) Atomic models: Rutherford, Bohr and Sommerfield-Origin of hydrogen spectrum-Electromagnetic radiation-Dualism of light-Black body radiation- Planck's quantum theory-Phtoelectric effect-Compton effect-de Broglie equation-Heisenberg uncertainty principle.

II) Periodic properties of elements: Atomic ionic radii, Ionization potential, electron affinity, electronegativity (Pauling and Mulliken's scale) of elements along period and groups, -Effective nuclear charge, screening effect, Slater rule

III) Postulates of quantum mechanics-operators: linear, non-linear, commutator- Schrodinger wave equation and derivation)-6LJQLILFDQFHRIzDQGz^2, wave mechanical concept of atomic orbitals.

B. CHEMICAL BONDING

I) Ionic bond-Factors influencing the ionic bond-Lattice energy- Inert pair effect-Fajan's rules-Born-Haber cycle-Born-Lande equation (derivation not required)

II) Covalent bond-Lewis theory-VSEPR theory-Shapes of BeF_2, BCl_3,$SnCl_2$, CCl_4, PF_5, Valence bond theory-Coordinate bond-Hybridization: sp^3,dsp^2, sp^3d^2, d^2sp^3

III) Shapes of orbitals,-quantum numbers-Zeeman effect-Pauling's exclusion principle, Hund, rule, Aufbau Principle, Electronic configuration of elements- MO theory, MO diagrams of O_2, N_2

IV) Intermolecular forces: hydrogen bond, van der Waals forces

V) Dipole moment

UNIT II

C. p-Block elements

i) General characteristic of p-block elements- Diborane-borax, borazine,mAlums, alloys of aluminium, allotropes of carbon

ii) Chemistry of oxides of carbon, silicon

iii) Compound of N and P-NH_2-NH_2, NH_2 OH, Fixation of N_2, PH_3, P_2O_5

D. d-BLOCK & f-BLOCK ELEMENTS

i) General characteristics of d-block elements: Melting points, Ionization energies, oxidation states, magnetic properties

ii) Alloys of iron, copper, Nickel, chromium- Gemstones: Ruby, Emerald, Sapphire iii) General characteristics of f-block elements

iv) Lanthanide, actinide contraction- consequences- UV spectra v) Separation and applications of lanthanides and actinides

UNIT III

E. COORDINATION CHEMISTRY

i) Classification of ligands, Complexes- IUPAC nomenclature, Isomerism. Mono and bidentateligands and their complexes- outer orbital inner orbital complexes

ii) Theories of coordination compounds: Werner's theory, VB theory, Crystal field theory, EAN rule iii) Applications of coordination compounds

F. NUCLEAR CHEMISTRY

i) Theory of nuclear reactions- alpha, beta and gamma rays- n/p ratio, isotopes. Isobars, isotones- Laws of radio activity- Radioactive equilibrium

ii) Types of nuclear reactions: Fission, fusion and spallation-Nuclear reactors iii) Applications of radio isotopes in industry, medicine and agriculture

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G. ANALYTICAL CHEMISTRY

Principles of volumetric analysis, gravimetric analysis, Separation and purification techniques- Redox titrations, complexometric titrations and Conductometric titrations.

PHYSICAL CHEMISTRY

UNIT-IV H. GASEOUS STATE

Gas laws: Boyle's law, Charles law, Avogadro's law- kinetic theory- ideal gas equation– deviation from ideal behaviour-Maxwell distribution of molecular velocities(no derivation)- mean, root mean square and most probable velocities-Calculation of molecular velocities-collision diameter- mean free path- collision numberbehaviour of real gases-deviation from ideal behaviour--Inversion temperature-Liquefaction of gases

I. SOLID STATE

i) Classification of solids, Isotropic and anisotropic crystals- Crystal systems- Laws of crystallographyMiller indices, Bravais lattices- Unit cell- Crystal symmetry- X-ray diffraction- Structures of NaCl, CsCl and ZnS-Bragg's equation-Radius ratio-Packing in crystals-defects in crystals

ii) Semiconductors: n and p –type, intrinsic and extrinsic semiconductors

UNIT- V

J. THERMODYNAMICS

i) Definitions: System and surrounding, isolated, closed and open systems- state of the system-intensive and extensive properties-Thermo dynamic processes: reversible and irreversible, isothermal and adiabatic processes, state and path functions

ii) First law of thermodynamics, Internal energy, enthalpy, heat capacity, Relationship between C_p and C_v Hess's law of constant heat summation-Kirchoff's equation- Second law of thermodynamics-Carnot theorem, entropy and probability-free energy and chemical equilibrium-Third law-Gibb's & Helmholtz functions

K. CHEMICAL KINETICS

i) Rate of reactions, rate law, Rate constant-order and molecularity of reactions- Derivation of first order rate constant, Zero order reaction, Effect of temperature on reaction rates- Half-life period, Activation energy-Arrehenius equation

ii) Theory of reaction rates, failure of collision theory-Significance of entropy and free energy of activation

UNIT-VI

L. COLLOIDS AND SURFACE CHEMISTRY

i) Classification of colloids-Preparation and purification of colloids-Properties of colloids-Stability of colloids-Gold number, gels- emulsion-types, emulsifiers-Application of colloids

ii) Adsorption-Physisorptio, chemisorption, difference between them-Factors influencing adsorption-Adsorption isotherm, Langmuir isotherm(no derivation)

M. ELECTROCHEMISTRY

i) Galvanic cells- Types of reversible and irreversible elcterodes-conventional representation of electrochemical cells. Nernst equation- reference electrodes, Computation of cell emf, Calculation of thermodynamic parameters of cell reactions-Over potential, Hydrogen over voltage.

ii) Arrhenius theory, Debye-Huckel equation- Kohlrausch law, Ostwald's dilution law – Determination of pH and pKa of acids by potentiometric methods-Corrosion- Types of corrosion-Prevention of corrosion

UNIT-VII

N. SPECTROSCOPY:

i) Electromagnetic spectrum-Different regions of spectra- Microwave spectra of diatomic molecules, rotational constants, selection rules-Infrared spectroscopy-Applications-Raman spectroscopy-Principles and applications

ii) Principles, instrumentation and applications of UV Vis, NMR, ESR and Mass spectrometry.

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ORGANIC CHEMISTRY UNIT-VIII

O. TYPES OF REACTIONS

i) Aliphatic nucleophilic substitution reactions –Aromatic electrophilic substitution reactions-Free radical reactions-Addition to C=C and C=O compounds – Elimination Reactions.

ii) Reduction and oxidation reactions – Oxidation with osmium tetroxide, ozone- reduction with $NaBH_4$, $LiAlH_4$

P. ELECTRON DISPLACEMENT METHODS

Inductive effects- Mesomeric effects, Hyper conjugation- Steric effects in substitution, addition and elimination reactions

Q) NOMENCLATURE OF ORGANIC COMPOUNDS

Classification of organic compounds-IUPAC nomenclature:alkanes, alkenes, alkynes, alcohols, aldehydes and ketones.

UNIT- IX

R. NATURE OF BONDING

1) Hybridization and geometry of simple organic compounds- Breaking of bonds- homolytic and heterolytic cleavage of C – C bonds-Reaction intermediates- free radicals : generation and stability- Carbocation and carbanion: formation and stability

S. STEREOCHEMISTRY

Stereoisomerism, definition and types- optical activity-asymmetric ccarbons, D and L notations, Enantiomerism, Diastereomerism- Racemization methods- Resolution methods-Walden inversionFisher, sawhorse and Newman projections-R and S notation of optical isomers: Cahn-Inhold and Prelog rules-Geometrical isomerism Z and E notations

UNIT X

T. MECHANISM IN AROMATIC SUBSTITUTION

i) Aromatic electrophilic substitution: Arenium ion mechanism: nitration, halogenation, sulphonation, Friedel Crafts reaction- Orientation and reactivity in monosubstituted benzene rings-Activating and deactivating groupsii) Aromatic nucleophilic substitution: S_NAr mechanism, Benzyne mechanism

U. CARBOHYDRATES

Classification of carbohydrates-Monosaccharides-D family sugars-L family sugars-EpimersMutarotation- Interconversion of glucose to fructose and vice versa, Reactions of monosaccharidesDisaccharides – Lactose, Maltose, Gentiobiose, Sucrose, Manufacture of sucrose, properties and uses.

V. MATERIAL CHEMISTRY

i) Polymers-Types of polymerization-Homopolymers- copolymers- Thermosetting and thermoplastic polymers-Vulcanization of rubber

ii) Dyes: Classification and Properties of dyes, Chromophores, auxochromes, Preparation of methyl orange, cangored, malachite green, fluorescein, indigo.

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