Maharaja Surajmal Brij University

Bharatpur (Raj.)

SYLLABUS

B.Sc. CHEMISTRY

(Part I, II, III)

Only For Session
2020-21

B.Sc. Part I, Session 2020-21
Chemistry

Scheme:

Max Marks: 150

	Duration (hrs.)	Max. Marks	Min. Pass Marks
Paper I	3	33	
Paper-II	3	33	36
Paper-III	3	34	
Practical	5	50	18

Note: Ten (10) questions are to be set taking two (02) questions from each unit. Candidates have to answer any 5 questions selecting at least one question from each unit.

CH-101 Paper I : Inorganic Chemistry
(2 hrs or 3 periods/ week)

Unit-I

Ionic Solids: Ionic structures, radius ratio effect and coordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy and Born Haber cycle, solvation energy and solubility of ionic solids, polarizing power and polarisability of ions, Fajan's rule.

Unit-II

Covalent Bond: Directional and Shapes of simple inorganic molecules and ions. Valence shell electron pair repulsion (VSEPR) theory to NH_3, H_3O^+, SF_4, ClF_3, ICl_2, H_2O.

Molecular Orbital Theory: Homonuclear and heteronuclear (CO and NO) diatomic molecules, bond strength and bond energy, percentage Ionic character from dipole moment. electronegativity difference.

Unit-III

S-Block Elements: Comparative study, diagonal relationships, salient features of hydrides, solvation, an introduction of alkyls and aryls.

Periodicity of p-block elements: Periodicity in properties of p-block elements with special reference to atomic and ionic radii, ionization energy, electron affinity, electro negativity, diagonal relationship, catenation.

Unit-IV

Some Important Compounds of p-block Elements: Hydrides of boron, diborane and higher hornnes, horazine, borazine, fullerenes, carbides, (structural principle), basic properties of halogens, interhalogens.

Chemistry of Noble Gases: Chemical properties of the noble gases, chemistry of Xenon, structure and bonding in Xenon compounds.

Unit- V

Nuclear Chemistry: Fundamental particles of nucleus (nucleons); Concept of nuclides and its representation; Isotopes, Isobars and Isotones (with specific examples);

Radiochemistry: Natural and artificial radioactivity; Radioactive disintegration series; Radioactive displacement law; Radioactivity decay rates; Half life and average life; Nuclear binding energy, Nuclear fission and fusion.

CH-102 Paper II : Organic Chemistry

(2 hrs or 3 periods / week)

Unit-I

Mechanism of Organic Reactions: Homolytic and heterolytic bond cleavage. Types of reagents, electrophiles and nucleophiles, Reactive intermediates - carbocations, carbanions, free radicals, carbenes, arynes and nitrenes (with examples). Types of organic reactions. Energy considerations.

Unit-II

Stereochemistry of Organic Compounds: Concept of isomerism, Types of isomerism, Difference between configuration and conformation, Flying wedge and Fischer projection formulae.

Optical Isomerism: Elements of symmetry, molecular chirality, enantiomers, stereogeniccentre, optical activity. Chiral and achiral molecules with two stereogenic centres. Diastereomers, threo and erythro isomers, meso compounds. Resolution of enantiomers. Inversion, retention and racemization (with examples).

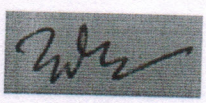
Relative and Geometric Isomerism determination of Configuration of Geometric Isomers cis/trans and E / Z systems of nomenclature.

Conformational Isomerism: Newman projection and Sawhorse formulae, Conformational analysis of ethane, n-butane.

Unit-III

Alkanes and Cycloalkanes : Classification of carbon atoms in alkanes. Methods of formation (with special reference of Wurtz reaction, Kolbe reaction. Corey House reaction and decarboxylation of carboxylic acids. Physical properties and chemical reactions of alkanes. Mechanism of free radical halogenation, Orientation, reactivity and selectivity. Cycloalkanes - nomenclature, methods of formation, chemical reactions. Baeyer's strain theory and its limitations. Theory of strainless rings.

Alkenes, Cycloalkenes, Dienes and Alkynes : Methods of formation, mechanisms of dehydration of alcohols and dehydrohalogenation of alkyl halides. Regioselectivity in alcohol dehydration - the Saytzeff rule, Hoffmann elimination, Chemical reactions of alkenes - mechanisms involved in hydrogenation, electrophilic and free radical additions. Markownikoff's rule, hydroboration-oxidation, oxymercurarion-reduction. Epoxidation, ozonolysis, hydration, hydroxylation and oxidation with $KMnO_4$ Polymerization of Alkenes.



Unit-IV

Arenes and Aromaticity: The aryl group, aromatic nucleus and side chain. Structure of benzene: molecular formula and Kekule structure. Stability and carbon-carbon bond lengths of benzene, resonance structure, MO diagram. Aromaticity: the Huckel rule, aromatic ions - three to eight membered.

Aromatic electrophilic substitution: General pattern of the mechanism, role of sigma and pi-complexes. Mechanism of nitration, halogenation, sulphonation, Friedel-Crafts reactions and chloromethylation. Activating and deactivating substituents. Directive influence - orientation and ortho/para ratio.

Unit-V

Alkyl and Aryl Halides: Methods of formation of alkyl halides, chemical reactions. Mechanisms of nucleophilic substitution reactions of alkyl halides S_N2 and S_N1 reactions with energy profile diagrams.

Polyhalogen compounds: Chloroform, carbon tetrachloride.

CH-103 Paper III: Physical Chemistry

(2 hrs. or 3 Periods/week)

Unit-I

Mathematical Concepts: Logarithmic relations, curve sketching, linear graphs and calculations of slopes, differentiation of functions like K_x, e^x, x^n, sinx and log x; maxima and minima, partial differentiation and reciprocity relations, integration of some useful/relevant functions :

Liquid State: Intermolecular forces, structure of liquids (a qualitative description). Structural differences between solids, liquids and gases. Liquid crystals: Difference between liquid crystal, solid and liquid. Classification, structure of nematic and cholestric phases.

Unit- II

Gaseous States: Postulates of kinetic theory of gases, deviation from ideal behavior, van der walls equation of state.

Critical Phenomenon: PV isotherms of real gases, the isotherms of van der walls equation, relationship between critical constants and van der walls constants, the law of - corresponding states, reduced equation of state.

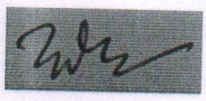
Molecular velocities: Root mean square, average and most probable velocities. Qualitative discussion of the Maxwell's distribution of molecular velocities. Liquification of gases (based on Joule-Thomson effect.)

Unit- III

Solid State: Definition of space lattice, unit cell.

Laws of crystallography- (i) Law of constancy of interfacial angles (ii) Law of rationality of indices (iii) Law of symmetry. Symmetry elements in crystals.

Basic concept of X-ray diffraction by crystals. Derivation of Bragg's equation Determinatioin of Crystal structure of NaCl and powder method.



Unit-IV

Colloidal State: Definition of colloids, classification of colloids.

Solids in liquids (sols) properties- kinetic, optical and electrical, stability of colloids. Protective action, Hardy-Schulze law, gold number.

Liquids in liquids (emulsions): types of emulsions, preparation. Emulsifier.

Unit-V

Chemical Kinetics: Chemical kinetics and its scope, rate of a reaction, factors influencing the rate of a reaction, concentration, temperature, pressure, solvent, light, catalyst. Concentration dependence of rates, mathematical characteristics of simple chemical reactions - zero order, first order, second order; pseudo order, half-life and mean-life. Determination of the order of reactions - differential method, method of integration, method of half-life period and isolation method.

Theories of chemical kinetics. Effect of temperature on rate of reaction, Arrhenius equation, concept of activation energy. Simple collision theory based on hard sphere model transition state theory (equilibrium hypothesis).

Practical: CH-104: Laboratory Course -I

(4 hrs or 6 periods / week)

(Instructions to the Examiners)

CHY 104: Chemistry Practical (Pass course)

Max. Marks: 50 **Duration of Exam: 5 hrs.** Minimum Pass Marks: 18

Inorganic Chemistry		
Ex.1	Separation and identification of 3 cations and 3 anions in the mixture	15
Organic Chemistry		
Ex.2	Laboratory Techniques	
Ex. 3	Qualitative Analysis	3
	Detection of element and detection of functional group	
Physical Chemistry		10
Ex. 4	Perform one of the experiments mentioned in the syllabus.	
Ex. 5	Viva-voce	12
Ex. 6	Record	5
	Total	50

Only For Session 2020-21

अकादमिक प्रभारी
महाराजा सूरजमल बृज विश्वविद्यालय
भरतपुर (राज.)