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**COURSES OF STUDY FOR
B.Sc. Examination (Chemistry)**

B.Sc. (Honours) Part-I

Session: 2016-2017

Time : 3 Hrs

F.M.: 75

CHEMISTRY PAPER : I

Nine questions to be set. Five questions to be answered. Short answer type questions are recommended. There may be several parts in a question and different units may be mixed in questions. While setting questions the entire syllabus may be covered as far as practicable. Two questions to be answered from group 'A' and three questions to be answered from group 'B'

Group : 'A' [Physical]

(Four questions)

25

Marks

1. Gaseous State:

Derivation of Van der Waal equation of state, critical phenomenon, critical constants and their evaluation in terms of van der waals

constants. Determination of van der waals constants, law of corresponding states, reduced equation of states, Boyle's temperature.

2. Liquid State:

Free volume of a liquid, vapour pressure, Trouton's rule, Surface tension, viscosity and their measurements, Molar volume, Parachor, Rheochor and chemical constitution, Kopp's law, internal pressure, solubility parameters, liquid crystal.

3. Phase Equilibria:

Phase rule and the definition of terms, involved in it, one component system. Water and sulphur system, two component system Ag-Pb, KI + water, eutectic point, Formation of compounds with congruent melting points, Deliquescence, efflorescence, triple points.

4. Electrical Transport:

Conductance in electrolytic solutions, Equivalent, specific and Molar conductance, cell constant, effect of dilution on conductance, Ionic mobility, migration of ions, Kohlrausch's law, transport number and its determination by Hittorff's methods, Applications of conductance measurements.

Group : 'B' [Inorganic]

**(Five questions)
Marks**

50

1. Periodic Properties:

Atomic and ionic radii, ionization potential, electron affinity and electro negativity, their trends in periodic table and application in explaining and predicting the chemical behaviours.

2. Chemical Bonding:

Covalent Bond: V.B. theory and its limitations, Directional characteristics of covalent bond, Hybridisation and shape of inorganic molecules and ions VSEPR theory with special reference to bond and electronegativity, M.O. theory. Homonuclear and Heteronuclear diatomic molecules [CO, NO], bond strength, bond energy. **Dipole moment:** Percentage ionic character in HX, Molecular geometry of polyatomic molecules.

Ionic Solids: Lattice energy, Born Haber cycle, solvation energy solubility of ionic solid, polarizing power and polarizability of ions, Fajan's rule. Weak interactions: H-bonding and van der waals forces.

3. s-Block Elements:

Comparative study, diagonal relationship, hydrides, solvation and complexing tendencies, an introduction to alkyl and aryl organometallics.

4. p-Block Elements:

Comparative study, relationship among metal, nonmetal and metalloids elements of group 13-17, elementary idea of hydrides, oxides and halides. Hydrides of boron, diborane and Higher boranes. Borazine, boro hydrides, fullerenes.

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CHEMISTRY PAPER : II

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Group : 'A' [Physical]

(Four questions)

25Marks

1. Atomic Structure:

Black body radiation and planck's quantum theory, Wave-particle, duality for electron and de-Broglie equation, experimental verification of de-Broglie equation by Davission and Germer experiment, de-Broglie wave associated with Bohr orbit in H-atom, Heisenberg uncertainty principle and its importance.

2. Solid State:

Types of solid, space lattice and unit cell, law of rational indices-Miller and Weiss indices. Interplaner spacing in cubic system, radius ratio and coordination number, packing of particles- Octahedral and tetrahedral voids.

3. Thermodynamic:

Objectives of thermodynamics, thermodynamic terms, First law and its mathematics formulation, Internal energy, enthalpy, C_p and C_v relation, Joule –Thomson effect, Joule Thomson coefficient for ideal an real gases, Inversion temperature, work done in irreversible expansion, Reversible and irreversible adiabatic expansion of an ideal gas.

4. Thermo-Chemistry:

Exergonic and endergonic compounds, enthalpy of reaction at constant volume and constant pressure, enthalpy of combustion, Bomb calorimeter, enthalpy of neutralization and ionization, Kirchoff's law, Hess's law, bond dissociation energy.

Group : 'B' [Organic]

**(Five questions)
Marks**

50

1. Estimation of nitrogen and sulphur in an organic compounds. Determination of molecular mass of a caboxylic acid by silver salt method and of an organic base by chloroplatinate salt method.

2. Structure and bonding:

Hybridization and geometry of hydrocarbons bond lengths, bond angles, bond dissociation energy, localized and delocalized chemical bond, Van der Waal interactions and hydrogen bonding resonance, hyperconjugation, inductive and electromeric effect, their effects on properties of compounds.

3. Mechanism of Organic Reactions:

Homolysis and heterolysis of covalent bonds. Types of reagents: electrophilic and nucleophilic. Types of organic reactions, energy consideration with reference to activation energy and transition state. Reactive intermediates: carbanions, carbocations and free radicals (generation, structure and stability).

4. Alcohols:

Classification and nomenclature, Monohydric alcohols: Methods of preparation, physical and properties. Distinction among 1°, 2° and 3° alcohols. Preparation and properties of (i) Ethylene glycol, (ii) Glycerol and (iii) Allyl alcohol.

5. Organometallic Compounds:

Organomagnesium compounds: The Grignard reagent-formation structure and application in organic synthesis. Basic idea about organometallics: Dimethylzinc, Dimethylcadmium, Alkyl lithium and Lithium dialkylcuprate.

6. Organosulphur Compounds:

Preliminary idea of organic sulphomides, sulphonics and sulphonic acids, methods of formation and chemical reactions of thiols and thioethers.

7. Aldehydes and ketones:

Nomenclature, structure of the carbonyl group, general methods of preparation, properties of aldehydes and ketones, an introduction to α - β unsaturated aldehydes and ketones.

8. Carboxylic acids:

General methods of preparations and properties of monocarboxylic acids and their derivatives such as ester, acid chlorides, amides and anhydrides. Methods of formation and chemical reactions of (i) unsaturated monocarboxylic acids and (ii) dicarboxylic acids

9. Organic compounds of nitrogen

Classification, nomenclature and structure of amines. Preparation and properties of aliphatic amines. Separation and identification of 1°, 2° and 3° amines. Preparation, properties and estimation of urea.

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CHEMISTRY PRACTICAL

Following exercise may be performed

1. Qualitative analysis of inorganic salt mixture containing four radicals.

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2. Qualitative organic analysis:

(a) Detection of elements: N, S and halogens, functional groups.

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(b) Detection of functional group in simple organic compounds (aldehydes, ketones, carboxylic acid, amides, amine, phenol, nitro group and sulphonic acid group) preparation of derivatives is not required

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3. Note book

05

4. Viva-voce

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