

**BHARATHIAR UNIVERSITY, COIMBATORE-641 046**  
**B.Sc. INDUSTRIAL CHEMISTRY AND APPLICATIONS WITH COMPULSORY**  
**DIPLOMA IN TEXTILE CHEMISTRY (CBCS PATTERN)**

(For the students admitted during the academic year 2008-2009 and onwards)

**SCHEME OF EXAMINATIONS - (I year only)**

Part	Study Components	Course Title	Ins. hrs / week	Examinations				Credit
				Dur.Hrs.	CIA	Marks	Total Marks	
	Semester I							
I	Language-I		6	3	25	75	100	3
II	English-I		6	3	25	75	100	3
III	Core I – General Chemistry Paper I		4	3	25	75	100	4
III	Core II – General Chemistry Paper II		4	3	25	75	100	4
III	General Chemistry Practical – I		2	-	-	-	-	-
III	Allied A - Paper I* (or) Paper I **		6	3	25	75	100	5
			4	3	20	55	75	4
III	Allied Practical**		2	-	-	-	-	-
IV	Environmental Studies		2	3	-	50	50	2
	Semester II							
I	Language-II		6	3	25	75	100	3
II	English-II		6	3	25	75	100	3
III	Core III – General Chemistry Paper III		5	3	25	75	100	4
III	General Chemistry Practical – I (Organic Analysis and Organic Preparations)		5	3	60	60	100	3
III	Allied A - Paper II* (or) Paper II **		6	3	25	75	100	5
			4	3	20	55	75	4
III	Allied Practical**		2	3	20	30	50	2
IV	Value Education - Human Rights		2	3	-	50	50	2

\* For subjects without practical

\*\* For subjects with Practical

**ALLIED SUBJECTS**

1. Mathematics
2. Physics
3. Botany
4. Zoology
5. Biochemistry

Note: The regulations, the syllabus for Value Education – Human Rights, II and III year will be uploaded shortly.

## GENERAL CHEMISTRY PAPER I

Teaching hours : 60 hours per semester ( 4 hours per week)

Subject Description : This paper presents the basic principles of Chemistry.

Goals : To enable the students to learn about the basic principles of Chemistry.

Objective : To understand the important concepts of Chemistry.

### CONTENTS

#### UNIT I

Ionic bonding - ionic crystals, NaCl and CsCl crystal structure, Lattice energy and its determination using Born-Haber cycle, factors affecting crystal lattice energy, properties of ionic crystals (high melting point, hardness, electrical conductivity in molten condition and in solution) – ion polarization - Fajan's rule-solubility of ionic compounds in polar solvent.

#### UNIT II

Structure and shape of molecules : VSEPR Theory and geometry of molecules. Hybridization and geometry of  $sp$ ,  $sp^2$ ,  $sp^3$ ,  $dsp^2$ ,  $dsp^3$ ,  $d^2sp^3$ ,  $sp^3d^2$  and  $sp^3d^3$ . Bonding, shapes and structures of the following molecules: Molecules with Sigma bonds only –  $BeCl_2$ ,  $SnCl_2$ ,  $BF_3$ ,  $CH_4$ ,  $SiF_4$ ,  $XeF_4$ ,  $PCl_5$ ,  $IF_5$ ,  $SF_6$ , and  $IF_7$ .

#### UNIT III

Polar effects – inductive effect, mesomeric effect, electromeric effect, hyper conjugation and steric effects.

Classification of reagents: Electrophiles, Nucleophiles and Free radicals.

Types of reaction: Polar reactions involving carbonium ions and carbanions with simple examples.

#### UNIT IV

Aliphatic Hydrocarbons: Restricted rotation about single bond preferred rotational conformations.

Alkenes: Preparation by Wittig reaction – Mechanisms of beta elimination – E1, E2 and cis elimination – Hoffmann's rule and Saytzeff's rule. Addition reactions with hydrogen, halogen, hydrogen halide

(Markownikoff's rule) and hydrogen bromide (Peroxide effect).

#### UNIT V

1. Dienes: Stability of isolated and conjugated dienes-1, 2 and 1, 4 additions, Diels-Alder reaction. Free Radical addition – Polymerization – synthetic rubber.
2. Cycloalkanes: Preparation by Dieckmann ring closure and by reduction of aromatic hydrocarbons – ring opening reactions of cyclopropane with  $H_2$ ,  $Br_2$  and  $HI$ .

## GENERAL CHEMISTRY PAPER II

Teaching hours: 60 hours per semester( 4 hours per week)

Subject description:

This paper presents the concept of resonance and wave mechanical treatment of electrons.

Goals:

To enable the students to learn about the basic concept of resonance and wave theory.

Objectives:

To study the resonance in benzene and quantum theory.

### CONTENTS

#### UNIT I:

Ozone and hydrogen peroxide – preparation, properties, structure, uses comparison between the two.

Selenium and Tellurium – Extraction, properties and Uses. Oxides and oxyacids of Se and Te. A comparative study of Sulphur, Selenium, Tellurium and their compounds (hydrides, oxides, halides)

#### UNIT II:

Benzene – Resonance and resonance energy, structure – polar effects in Electrophilic substitution in benzene – mechanism of Nitration, Sulphonation, Halogenation, Friedal-Crafts alkylation and acylation-diazo coupling.

Alkynes: Acidity of Alkynes – formation of acetylides-addition of water with  $\text{HgSO}_4$  catalyst-hydroboration.

#### UNIT III:

Liquid crystals–the concept of mesomorphic state-typical liquid crystalline substances and their properties.

Properties of liquids like surface tension and viscosity – Review of structural differences between solids, liquids and gases.

Condensed phases-Coefficients of thermal expansion and compressibility of liquids and solids.

#### UNIT IV:

Failure of classical theory in explaining black body radiation- Planck's theory of quantization of energy – Einstein theory of photoelectric effect-Compton effect.

De Broglie theory of wave-particle dualism-Heisenberg's uncertainty principle.

#### UNIT V:

An elementary treatment of Schrodinger wave equation – quantum numbers concept of orbitals-significance of  $\psi$  &  $\psi^2$  free particles and particle in a box (one and three dimensional)

The covalent bonds-the hydrogen molecule – the valence bond method hydrogen molecule ion-molecular orbital method-molecular orbitals for homonuclear and heteronuclear diatomic molecules.

## GENERAL CHEMISTRY PAPER III

Teaching hours: 60 hours per semester ( 4 hours per week)

### Subject description:

This paper presents the concept of coordination chemistry, aromaticity and thermodynamics.

### Goals:

To enable the students to learn about aromaticity, thermodynamics and coordination chemistry.

Objectives: To study the principles of thermodynamics and coordination chemistry.

### Contents

#### UNIT I:

Co-ordination compounds – Nomenclature – conductivity and precipitation studies – Werner Co-ordination theory – electronic interpretation of coordinate bond by Sidgwick. Isomerism: Examples of Geometrical and optical isomerism in square planar and octahedral coordination compounds – magnetic properties of coordination compounds and their interpretation by Pauling's valence bond theory and crystal field theory.

#### UNIT II:

Chemistry of Boron family – Group discussion – Electron acceptor behaviour and electron deficiency of boron hydrides; bonding in diboranes;  $\text{NaBH}_4$ ,  $\text{LiBH}_4$  preparation, properties, structure and uses- borozoles, borides.

Classification of silicate- simple silicates chain silicates and sheet silicates only.

#### UNIT III:

Aromaticity-Huckel's rule Non-benzenoid aromatic compounds like cyclopentadienyl anion. Toluene and Isopropyl benzene and side chain substitution – polymerization of styrene. Vinyl chloride Relative reactivity of methyl, ethyl and vinyl chlorides. Grignard reagents and synthetic applications-Nucleophilic substitution reaction –  $\text{S}_{\text{N}}1$ ,  $\text{S}_{\text{N}}2$  and  $\text{S}_{\text{N}}\text{i}$  reactions – Effect of solvent-nucleophile, structure of substrate and neighbouring group participation, elimination versus substitution-Benzene mechanism and intermediate complex mechanism.

#### UNIT IV:

The laws of thermodynamics, generalities and Zeroth law – kinds of energy – Scope of the first and second laws of thermodynamics-thermodynamic terms-definitions – heat – work of expansion – work of compression – maximum and minimum quantities of work – Reversible and irreversible transformations – energy and first law of thermodynamics – properties of energy changes in relation to properties of system is thermal and adiabatic changes – meaning of the thermodynamic state function – properties of exact and inexact differentials – Joule Thomson experiment Relation between E and H,  $C_p$  and  $C_v$ .

#### UNIT V:

Application of the first law of thermodynamics to chemical reactions. The heat of reaction – conventional value of H. The determination of heats of formation – sequences of reactions – Hess's law – heats of combustions – determination by Bomb Calorimeter – Bond energies – Resonance energies – Heats of solution – integral and differential dilution – Heats of

reaction at constant volume – dependence of the heat of reaction on temperature and Kirchoff's equation.

**TEXTBOOKS FOR REFERENCE:**

1. Principles of Inorganic Chemistry, B.R. Puri L.R. Sharma, Shobanlal Nagin Chand & Co.
2. Inorganic Chemistry, P.L.Soni, Sultan Chand & Sons.
3. Organic Chemistry, Vol. 1, 2, 3, S. M. Mugheree, S.P. Singh, R.P. Kapoor, Wiley Eastern.
4. Advanced Organic Chemistry, B.S. Bahl, Arun bahl, S.Chand & Co.
5. Essentials of Physical Chemistry, B.S. Bahl and G.D. Tuli, S.Chand & Co.
6. Text book of Physical Chemistry, P.L.Soni, D.B. Dharmarke, Sultan Chand & Sons.

**GENERAL CHEMISTRY PRACTICAL I**

**GENERAL CHEMISTRY PRACTICAL I**

**Organic Analysis and Organic Preparations**

**I & II Semesters (3 hours per week)**

**Systematic Analysis of Organic substances :**

Detection of Elements (N, S, Halogens)

To distinguish between aliphatic and aromatic.

To distinguish between saturated and unsaturated.

Functional group tests for phenols, acids (mono and di), aromatic primary amine, amides, diamides, carbohydrates, nitro compounds, aldehydes, ketones