

**BHARATHIAR UNIVERSITY, COIMBATORE -641 046**  
**B.Sc. CHEMISTRY - SCHEME OF EXAMINATIONS (CBCS PATTERN)**  
**(For the students admitted from the academic year 2016-2017 and onwards)**

Part	Study Components	Course Title	Ins. hrs / week	Exam			Credits
				CIA	Uni. exam	Total	
<b>Semester I</b>							
I	Language-I	11T	6	25	75	100	4
II	English-I	12E	6	25	75	100	4
III	Core I – Chemistry Paper I	13A	7	25	75	100	4
III	Core Chemistry Practical – I		3	-	-	-	-
III	Allied A - Paper I* (or) (Math - I) Paper I**	1AA	6	25	75	100	4
			4	20	55	75	3
III	Allied Practical**		2	-	-	-	-
IV	Environmental Studies #	1FA	2	-	50	50	2
<b>Semester II</b>							
I	Language-II	21T	6	25	75	100	4
II	English-II	22E	6	25	75	100	4
III	Core II– Chemistry Paper II	23A	7	25	75	100	4
III	Core III– Chemistry Practical I (Inorganic Quality Analysis)	28P	3	40	60	100	4
III	Allied A - Paper II* (or) (Math - II) Paper II**	2AA	6	25	75	100	4
			4	20	55	75	3
III	Allied Practical**		2	20	30	50	2
IV	Value Education - Human Rights #	2FB	2	-	50	50	2
<b>Semester III</b>							
I	Language-III	31T	6	25	75	100	4
II	English-III	32E	6	25	75	100	4
III	Core IV – Chemistry Paper III	33A	3	25	75	100	4
III	Core V – Chemistry Paper IV	33B	3	25	75	100	4
III	Core Practical II		2	-	-	-	-
III	Allied B - Paper I* (or) (Physics - I) Paper I**	3AF	6	25	75	100	4
			4	20	55	75	3
III	Allied Practical**		2	-	-	-	-
IV	Skill Based Subject Chemistry of natural and synthetic fibers	3ZA	2	20	55	75	3
IV	Tamil @/Advanced Tamil # (Or) Non-Major Elective - I (yoga/women's rights #)	3FL	2	-	50	50	2
<b>Semester IV</b>							
I	Language-IV	41T	6	25	75	100	4
II	English-IV	42E	6	25	75	100	4
III	Core VI – Chemistry Paper V	48A	4	25	75	100	4
III	Core VII– Chemistry Practical II (Volumetric and Organic Analysis)	48P	3	40	60	100	4
III	Allied B - Paper II* (or) (Physics/II) Paper II**	4BF	6	25	75	100	4
			4	20	55	75	3
III	Allied Practical** (Physics - II)	4PF	2	20	30	50	2





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**CORE IV - CHEMISTRY PAPER III****Teaching hours: 45 hours per semester (3 hours per week)****Subject description:** This paper presents the principle in the extraction of metals and mechanism of some important organic reactions.**Goals:** To enable the students to learn about the extraction principles and mechanism of some addition reaction.**Objectives:** To understand the mechanism and synthetic uses of important organic reactions.**Course outcome:**

1. To understand the extraction of metals.
2. To gain the knowledge on the chemistry of carbonyl compounds.
3. To understand the geometrical isomerism.
4. To understand the metals and alloys.

**Unit - I**

General methods of Extraction: Concentration – Gravity separation, Froth Flotation, magnetic separation, Extraction – Chemical and Electrolytic methods of refining, Zone refining, Van Arkel refining and Electrolytic refining with examples. Occurrence, extraction, properties and uses of Germanium and Titanium - their important compounds such as  $\text{GeCl}_4$  and  $\text{TiO}_2$ .

**Unit - II**

Chemistry of Carbonyl Compounds – I: Reaction mechanisms: Nucleophilic addition of Grignard reagent,  $\text{NH}_3$ , primary amine- Aldol condensation, Cannizzaro reaction, Perkin reaction, Knoevenagel reaction and Claisen- Schmidt reaction.

**Unit-III**

Chemistry of Carbonyl Compounds – II Reaction mechanisms – Reformatsky reaction, benzoin condensation, Wurtz reaction, haloform reaction – Reaction with  $\text{LiAlH}_4$  and  $\text{NaBH}_4$  – Clemmensen reduction, Wolff Kishner reduction, MPV reduction – reducing properties of Carbonyl compounds.

**Unit - IV**

Malonic ester, acetoacetic ester and cyanoacetic ester-their preparation and synthetic applications. Tautomerism of acetoacetic ester. Geometrical isomerism – Cis & Trans, E & Z notations – Geometrical isomerism in maleic acid and fumaric acid - physical and chemical properties of geometrical isomers.

**Unit-V**

Structure of metals and alloys-substitutional and interstitial solid solution-Hume Rothery ratios-metallic bonding-electrical, optical and mechanical properties of metals-semiconductors, intrinsic and extrinsic-uses. Super conductors-An elementary treatment.

**Programme outcome:**

1. Understood chemical and electrochemical principles involved in the extraction of metals.
2. Gained the knowledge on the chemistry of carbonyl compounds
3. Understood the geometrical isomerism.
4. Understood the metals and alloys, substitutional and interstitial solid solution.

Text Books



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*Annexure No:21*  
*SCAA Dated: 09.05.2019*

**UNIT V**

C program for chemistry-Structure of C program, Variables in C, C Keywords and constants in C. Operators in C – Arithmetic, Increment, Decrement, relational and logical operators. Program: To calculate the pH of solutions– Calculation of pH of solution using Henderson equation- to compute the rate constant of a first order reaction – to compute the energy of activation of a reaction-Program to convert Fahrenheit to Celsius program-to calculate molecular weight of compounds ( $C_6H_6$ ,  $C_2H_5OH$ ).

**Programme outcome:**

1. Acquired the knowledge of Thermodynamics.
2. Understood the surface phenomenon of solids i.e., adsorption and catalysis.
3. Understood the chromatography techniques.
4. Understood the chemistry in computer applications.

**REFERENCES**

1. Principles of physical chemistry, B.P.Puri, L.R.Sharma and M.S.Phathania, S.Chand & Company
2. Physical chemistry G,W.Castelan, Narosa Publishers.
3. Physical chemistry (Vol.II) – N.B.Singh, ShivasaranDas,A.K.Singh –New Age International Publishers – First edition(2009)
4. Introduction to Chromatography – V.K.Srivatsava and K.K.Srivatsava – S.Chand& Company – Second edition(1981)
5. Computer for Chemists – By PundirBansal – Pragati Prakasam Pubs.

**CORE VI - CHEMISTRY PAPER V**

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

**Subject description:** This paper presents the chemistry of few metals, phenols, amines and phase rule.

**Goals:** To enable the students to learn about the reactions of phenol and amines.

**Objectives:** To study the reaction of phenol and amines and applications of phase rule.

**UNIT I**

Occurrence, extraction, properties and uses of Zirconium, Vanadium, Molybdenum and Tungsten -their important compounds  $V_2O_5$ ,  $ZrOCl_2$ , ammonium molybdate, molybdenum blue,  $WO_2$ , and tungsten bronzes.

**UNIT II**

Monohydric phenols - preparation & properties –Reaction of monohydric phenols with mechanism – alkylation, esterification, nitration, sulphonation, halogenation coupling with diazonium salts – Kolbe, Reimer – Tiemann, Schotten – Bauman and Gattermann reactions.

**UNIT III**

Amines- Preparation and properties of aliphatic and aromatic primary, secondary and tertiary amines – their separation, comparison of their basicity – ring substitution, diazotization and coupling reaction of aromatic amines. Diazomethane and diazoacetic ester – preparation,





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### CORE V – CHEMISTRY PAPER IV

Teaching hours: 45 hours per semester (3 hours per week)

**Subject description:** This paper presents the basic aspects of the second and third laws of thermodynamics, adsorption, chromatography and computer programming.

**Goals:** To enable the students to understand the second and third laws of thermodynamics, catalysis, adsorption and the Computer C Programming.

**Objectives:** To study the applications of computer programming in chemistry and the importance of mechanism of catalysis and thermodynamics, adsorption and chromatography.

**Course outcome:**

1. To acquire the knowledge of Thermodynamics.
2. To understand the surface phenomenon of solids i.e., adsorption and catalysis.
3. To understand the chromatography techniques.
4. To understand the chemistry in computer applications.

#### UNIT - I

Introduction to second law of thermodynamics – Carnot cycle – entropy – Definition – Entropy changes in isothermal transformation – Trouton's rule. Entropy as function of T and V – Entropy as a function of T and P – Changes of entropy with T, Entropy changes in ideal gas – entropy of mixing of ideal gases.

#### UNIT II

General conditions of equilibrium and spontaneity- conditions of equilibrium and spontaneity – definition of A and G – physical significance of  $dA$  and  $dG$ . Temperature and pressure dependence of G – Gibbs – Helmholtz equation. Chemical equilibrium – The concept of chemical potential – chemical potential in a mixture of ideal gases – Van't Hoff Isotherm, isobar and isochore – Third law of thermodynamics – statement and applications. Exception to third law.

#### UNIT III

**Adsorption and Catalysis :** Adsorption – types, differences between chemisorption and physisorption – Adsorption of Gases by solids – Adsorption isotherms – Freundlich, Langmuir isotherms-derivations – BET equation (Derivation not required) – Adsorption from solution – ion exchange adsorption-Types and applications – Techniques to determine the adsorbed molecules on solid surfaces.

Catalysis – classification – differences between Homogeneous and Heterogeneous catalysis – Acid Base catalysis – Kinetics and Mechanisms – Autocatalysis – Enzyme catalysis- Characteristics and mechanism - Michaelis – Menton equation.

#### UNIT IV

**Chromatography :** Chromatographic methods – Partition, Adsorption – Basic principles – Differential migration, adsorption phenomenon, nature of adsorbents, choice of solvents and  $R_f$  value – Techniques and applications of Paper, Column and TLC – Gas chromatography and HPLC (Basic principles only).