

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	
Semester I							
I	Language-I		6	25	75	100	4
II	English-I		6	25	75	100	4
III	Core I – Chemistry Paper I		7	25	75	100	4
III	Core Chemistry Practical – I		3	-	-	-	-
III	Allied A - Paper I* (or) Paper I **		6	25	75	100	4
			4	20	55	75	3
III	Allied Practical**		2	-	-	-	-
IV	Environmental Studies #		2	-	50	50	2
Semester II							
I	Language-II		6	25	75	100	4
II	English-II		6	25	75	100	4
III	Core II– Chemistry Paper II		7	25	75	100	4
III	Core III– Chemistry Practical I (Inorganic Quality Analysis)		3	40	60	100	4
III	Allied A - Paper II* (or) Paper II **		6	25	75	100	4
			4	20	55	75	3
III	Allied Practical**		2	20	30	50	2
IV	Value Education - Human Rights #		2	-	50	50	2
Semester III							
I	Language-III		6	25	75	100	4
II	English-III		6	25	75	100	4
III	Core IV – Chemistry Paper III		3	25	75	100	4
III	Core V – Chemistry Paper IV		3	25	75	100	4
III	Core Practical II		2	-	-	-	-
III	Allied B - Paper I* (or) Paper I**		6	25	75	100	4
			4	20	55	75	3
III	Allied Practical**		2	-	-	-	-
IV	Skill Based Subject Chemistry of natural and synthetic fibers		2	20	55	75	3
IV	Tamil @/Advanced Tamil # (Or) Non-Major Elective - I (yoga/women's rights #)		2	-	50	50	2
Semester IV							
I	Language-IV		6	25	75	100	4
II	English-IV		6	25	75	100	4
III	Core VI – Chemistry Paper V		4	25	75	100	4
III	Core VII– Chemistry Practical II (Volumetric and Organic Analysis)		3	40	60	100	4
III	Allied B - Paper II* (or) Paper II**		6	25	75	100	4
			4	20	55	75	3
III	Allied Practical**		2	20	30	50	2

Part	Study Components	Course Title	Ins. hrs / week	Exam			Credits
				CIA	Uni. exam	Total	
IV	Skill based Subject	Technology of Dyeing of Natural Fibres	3	20	55	75	3
IV	Tamil @/Advanced Tamil # (OR)	Non-major elective -II (General Awareness #)	2	-	50	50	2
Semester V							
III	Core VIII – Chemistry Paper VI		5	25	75	100	4
III	Core IX – Chemistry Paper VII		5	25	75	100	4
III	Core X – Chemistry Paper VIII		5	25	75	100	4
III	Core XI – Chemistry Paper IX		4	25	75	100	4
III	Core - Chemistry Practical III		4	-	-	-	-
III	Elective –I From Group I		4	25	75	100	4
IV	Skill based Subject	Water & Effluent Treatment And Pollution Control	3	20	55	75	3
Semester VI							
III	Core XII – Chemistry Paper X		5	25	75	100	4
III	Core XIII - Chemistry Paper XI		5	25	75	100	4
III	Core XIV - Chemistry Practical III	Gravimetric And Physical	7	40	60	100	4
III	Elective –II From Group II		4	20	55	75	3
III	Elective –III From Group III		4	20	55	75	3
III	Core XV– Practical for Elective subjects		3	40	60	100	4
IV	Skill based Subject	Textile Chemistry Practical	2	30	45	75	3
V	Extension Activities @		-	-	-	50	2
Total						3500	140

* For subjects without practical ** For subjects with Practical

@ No University Examinations. Only Continuous Internal Assessment (CIA)

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List of elective papers (colleges can choose any one of the papers as electives)

Elective I	Elective II	Elective III
(A) polymer chemistry	(A) Leather chemistry	(A)Analytical chemistry II Lab Techniques
(B) Agro industrial chemistry	(B)Chemistry of plant based products	(B)Environmental chemistry
(C) Pharmaceutical chemistry	(C)Dye chemistry	(C)Textile chemistry

ALLIED SUBJECTS

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

Note : The syllabus for the following papers furnished below be followed and there is no change in the existing scheme of examination and syllabi of remaining papers.

SEMESTER II

CORE II - CHEMISTRY PAPER II

Teaching hours: 60 hours per semester

Subject description:

This paper presents the concept of acids and bases, chemistry of boron, silicon, 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:

. Acids and bases; Definitions- different approaches to protonic acid – base systems – strengths of Lewis Acids and Bases -Hard and Soft Acids and Bases. Applications of HSAB concept Basis of hardness and softness, limitations of HSAB concept.

Unit II:

Chemistry of Boron family – Group discussion – Electron acceptor behaviour and electron deficiency of boron hydrides; bonding in diboranes; NaBH_4 , LiBH_4 preparation, properties, structure and uses- borozoels, borides.

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

Unit III:

Structure of benzene-Electrophilic substitution in benzene with mechanism-Aromaticity-Huckel's rule. 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 – Elimination versus substitution-Benzyne 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 & path function – 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. Mughergee, 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.

SEMESTER III: CORE V – CHEMISTRY PAPER IV

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

Subject description

This paper presents the basic aspects of thermodynamics, adsorption, chromatography and computer programming.

Goals

To enable the students to understand the laws of thermodynamics, adsorption and the Computer C Programming.

Objectives

To study the applications of computer programming in chemistry and the importance of thermodynamics, adsorption and chromatography.

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 under constants – definition of ΔA and ΔG – physical significance of $-dA$ and dG .

Temperature and pressure dependence of ΔG – Gibbs – Helmholtz equation. Chemical equilibrium – The concept of chemical potential – chemical potential in a mixture of ideal gases – van't Hoff Isotherm 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 solutions – 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 — 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).

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 and to find that it is basic, acidic or neutral – 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.

REFERENCES:

- 1 .Principles of physical chemistry, B.P.Puri, L.R.Sharma and M.S.Phathania, Shobanlal Nagin Chand & Co.
2. Physical chemistry G,W.Castelan, Narosa publishers.
3. Physical chemistry(volll) – 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 – PragatiPrakasam 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.

Contents

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, structure and their synthetic applications.

UNIT IV :

Ionic Equilibria -Solubility and solubility product-determination of solubility product-Applications of solubility product principle. Dissociation of weak acids and bases-Dissociation constants-pH scale-common ion effect-buffer solutions- Determination of pH values of buffer mixtures-Henderson's equation-Hydrolysis of salts-Degree of hydrolysis.

UNIT V :

Solutions: ideal and non ideal – Raoult's law, Henry's law – Nernst distribution law and its applications.

Colligative properties- relative lowering of vapour pressure, elevation of boiling point, depression of freezing point and osmotic pressure- their applications.

CORE X - CHEMISTRY PAPER VIII

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

Subject description

This paper presents about phase rule, phase equilibria and the principles of conduction Electro motive force, and fuel cells.

Goals To enable the students to know about electro chemistry.

Objectives To study EMF, pH and their applications.

Contents

UNIT I :

Phase rule and phase equilibria –the equilibrium condition. Stability of phase of a pure substance. Pressure dependence of μ and T curves. The Clapeyron and Clapeyron-Clausius equations. Derivation of Gibbs phase rule. Phase equilibria in one component system. Phase diagram for sulphur, water, carbon dioxide system, phase diagram for two component system – construction of the phase diagram/Thermal analysis method Bi-Cd; Zn-Mg and Na-K system.

UNIT II:

Electrical conduction, conduction in metals and in electrolytic solutions. Measurement of conductivity in electrolytic solutions. Migration of ions-Kohlrausch's law. Arrhenius theory of electrolytic dissociation-Ostwald's dilution law. Theory of strong electrolytes-Debye-Huckel-Onsager theory (elementary account only) verification. Debye-Falkenhagen effect-Wien effect-Transport numbers-Determination. Conductometric titrations.

UNIT III:

Electrochemical cells. Electrode potentials-The standard hydrogen electrode kinds of electrodes and their potentials-Nernst equation. EMF-computation and measurement of cell EMF. Single electrode potential-Determination and significance of electrode potentials- electro chemical series- temperature dependence of the cell EMF- Thermodynamic quantities of cell reactions.

UNIT IV:

Reference electrodes-Electrodes for measurement of pH-concentration cells with and without transport-liquid junction potential-applications of EMF measurements. Redox potential-Redox indicators-uses. Potentiometric titrations.

UNIT V:

Fuel cells: Hydrogen- oxygen cell and hydrocarbon - oxygen cell. Storage cells. Lead storage cell and Nickel cadmium cell. Decomposition voltage-over voltage-Deposition and discharge potential.

**CORE XIV - CHEMISTRY PRACTICAL III
GRAVIMETRIC ANALYSIS AND CHEMISTRY PHYSICAL
V & VI TH SEMESTERS**

I. GRAVIMETRIC ANALYSIS :

1. Estimation of Sulphate as Barium Sulphate.
2. Estimation of Barium as Barium Chromate.
3. Estimation of Lead as Lead Chromate.
4. Estimation of Calcium as Calcium Oxalate.
5. Estimation of Nickel as Nickel Dimethyl glyoximate.

II. PHYSICAL CHEMISTRY EXPERIMENTS :

1. Determination of rate constant of acid-catalysed hydrolysis of an ester (Methyl acetate or Ethyl acetate).
2. Determination of K_f / molecular weight by Rast's macro method-Naphthalene, Diphenyl and diphenylamine
3. Determination of critical solution temperature of Phenol-Water system.
4. Effect of impurity (NaCl, succinic acid) on CST.
5. Phase Diagram – Simple Eutectic system.
6. Determination of cell constant, specific conductivity and equivalent conductivity of strong electrolyte.
7. Determination of dissociation constant of a weak acid (acetic acid).
8. Conductometric titrations, strong-acid-strong base.
9. Conductometric titrations, Weak-acid-strong base.