



Government of Karnataka
DEPARTMENT OF COLLEGIATE AND TECHNICAL EDUCATION
GOVERNMENT COLLEGE, KALABURAGI
(AN AUTONOMOUS INSTITUTION)



Phone: 08472-245064

Sedam Road, Kalaburagi-585 105
(Re-Accredited by NACC with "B" Grade)

www.gcak.ac.in

DEPARTMENT OF CHEMISTRY

GOVERNMENT COLLEGE, KALABURAGI

Syllabus of Under Graduate Course (Chemistry)

STATE EDUCATION POLICY 2024-25

(SYLLABUS FOR THE ACADEMIC YEAR 2024-25 ONWARDS)



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Undergraduate Program in Chemistry SEP-2024-25

PREAMBLE

As per the directive from the Government of Karnataka and Government College Kalaburagi (Autonomous), the Chemistry syllabus for the B. Sc., degree programme (According to SEP) has to be prepared for the I year. The Karnataka State Government proposed and asked to follow SEP 2024-25 syllabus for the undergraduate programs in universities and colleges [subjects with practicals].

The Department of Chemistry, Government College Autonomous Kalaburagi with the help of the BOS members held a meeting on 02-07-2024 and prepared a draft syllabus keeping in view the aims of the SEP curriculum in developing interdisciplinary skills in students linking general studies with professional courses and allowing both vertical and horizontal mobility and also catering to local needs.

Chemistry Course in the B.Sc degree Programme is a State Education Policy in (SEP) Semester Scheme spread over all Semesters. The course seeks to familiarize students from basic level to high level chemistry which connects PG programme. Due importance is also given to the study of application oriented topics which is very much essential and useful for present science students.

The final draft incorporating the suggestions was placed before the Department Council and then to the Board of Studies in Chemistry on 05-08-2024 for approval.

1) H. V. M. S. 2) [Signature] 3) [Signature] 4) [Signature] 5) [Signature] 6) [Signature]
7)



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DEPARTMENT OF CHEMISTRY

BOARD OF STUDIES IN CHEMISTRY

A Board of studies shall consist of the following members.

- 1) **Dr. Vijayanand Vithalrao**
Government College(Autonomous) Kalaburagi.
- 2) **Prof. Beede Suneelkumar**
Government College (Autonomous) Kalaburagi.
- 3) **Prof. Mahadev Dhanraj**
Government College(Autonomous) Kalaburagi.
- 4) **Prof. Roopa Kulkarni**
Government College (Autonomous) Kalaburagi.
- 5) **Prof. Gajre Vaman**
Govt. First Grade College Sedum.
- 6) **Dr. Dhondiba Viswanath**
Govt. First Grade Women's College Kalaburgi.
- 7) **Prof. Anand Saundane**
Gulbarga University Kalaburgi.

Armeda
CHAIRMAN

1) *Armeda* 2) *Armeda* 3) *Armeda* 4) *Armeda* 5) *Armeda* 6) *Armeda* 7) *Armeda*



Government of Karnataka

**DEPARTMENT OF COLLEGIATE AND TECHNICAL EDUCATION
GOVERNMENT COLLEGE KALABURAGI**

(AN AUTONOMOUS INSTITUTION)-585105.

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Phone: 08472-245064

www.gcak.ac.in

Ref No.: GCK(AI)/BOS(UG)/2024-25/

Date : /08/2024

OFFICE ORDER

Subject : Appointment of members of Board of Studies (UG)

Reference: 1. UGC Revised Guidelines for Autonomous Colleges dt. : 19.01.2018

2. Registrar, GUK Letter No. ಗುಕಿಲ/ಬಿಎಲ್ಡಿ/ಇಲಾಖೆ/2024-25/190 Dated 29.07.2024

3. Resolution of the DC meeting held on 30/07/2024

Advert to the cited subject and references, the Board of Studies (UG) have been constituted as shown below.

BOARD OF STUDIES (UG) IN CHEMISTRY

Sl No.	Name of the Members	Designation	Address with Phone No & Email	Appointed as
1	Dr. Vijayanand Vithalrao Associate Professor	Asso. Prof.	v_havanoor@rediffmail.com	Chairman
2	Prof. Beede Suneelkumar Associate Professor	Asso. Prof.	naguyogi_beede@rediffmail.com 8310857363	Member
3	Dr. Mahadev U Assistant Professor	Assis. Prof.	mahadev510@gmail.com 8310258620	Member
4	Prof. Roopa Kulkarni Assistant Professor	Assis. Prof.	shrishk.rk@gmail.com 9886200282	Member
5	Dr. Vaman Gajre Associative Professor, Govt. First Grade College Sedam, Dist. Kalaburagi	Asso. Prof.	vamangajre66@gmail.com 9916952204	External Member (other than parent University)
6	Dr. Dhondiba Vishwanath Associative Professor, Govt. First Grade College Womens Kalaburagi.	Asso. Prof.	dhondibavishsurya123@gmail.com	External Member (other than parent University)
7	Prof. Anand Soundane, Professor and Chairman Department of P. G. Studies and Research in Chemistry Gulbarga University, Kalaburgi-06	Professor	arsaundane @rediffmail.com 9480272325	University Nominee
8	Devendra Lingappa Priyanka agro tech. Plot No.124,kapnoor Indl. area, Humnabad road, Kalaburgi	Industrialist Representative	devendralingappa8@gmail.com 9141363430	External Member representing Industry
9	Dr. Vijayakumar Salimani Assistant Professor Department of studies in History, Government College (Autonomous) Kalaburagi-577002	Asso. Prof.	drvijayanand410@gmail.com 9902485607	Alumni Member

The term of nominated members shall be 03 years from the date of this Order.

Copy to:

1. Chairman, Board of Studies (UG) in CHEMISTRY
2. All the members of the BOS
3. Academic Dean (UG) Govt. College (Autonomous), Kalaburagi
4. Office Copy.

1) 2) 3) 4) 5) 6)

7)



Ref No.: GCK(AI)/BOS(UG)/2024-25/

Date : 05/08/2024

BOARD OF STUDIES (UG) IN CHEMISTRY

Sl No.	Name of the Members	Responsibilities	Address with Phone No & Email	Signature
1	Dr. Vijayanand Vithalrao Associate Professor	Chairman	v_havanoor@rediffmail.com	
2	Prof. Beede Suneelkumar Associate Professor	Member	naguyogi_beede@rediffmail.com 8310857363	
3	Dr. Mahadev U Assistant Professor	Member	mahadev510@gmail.com 8310258620	
4	Prof. Roopa Kulkarni Assistant Professor	Member	shrishk.rk@gmail.com 9886200282	
5	Dr. Vaman Gajre Associative Professor, Govt. First Grade College Sedam, Dist. Kalaburagi	External	vamangajre66@gmail.com 9916952204	
6	Dr. Dhondiba Vishwanath Associative Professor, Govt. First Grade College Womens Kalaburagi.	External Member	dhondibavishwsurya123@gmail.com	
7	Prof. Anand Soundane, Professor and Chairman Department of P. G. Studies and Research in Chemistry Gulbarga University, Kalaburgi-06	University Nominee	arsoundane@rediffmail.com 9480272325	
8	Devendra Lingappa Priyanka agro tech. Plot No.124,kapnoor Indl. area, Humnabad road, Kalaburgi	Industrial Representative	devendralingappa8@gmail.com 9141363430	
9	Dr. Vijayakumar Salimani Assistant Professor Department of studies in History, Government College (Autonomous) Kalaburagi-577002	Alumini Member	drvijayanand410@gmail.com 9902485607	

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Ref No.: GCAK(AI) /BOS(UG)/2024-25/

Date :

SEM	Course Category	Course Code	Title of the Paper	Marks			Teaching hours / week			Credits	Duration of Exams (Hrs)
				Sem. Exam	IA	Total	L	T	P		
I	Language-1	MIL		80	20	100	4	-	-	3	3
	Language-2	MEL		80	20	100	4	-	-	3	3
	CC/CV	AECC		40	10	50	2	-	-	2	2
	DSC	DSC-T-1	DSC-I Chemistry Paper-I	80	20	100	3	-	-	3	3
	DSC	-		80	20	100	3	-	-	3	3
	DSC	-		80	20	100	3	-	-	3	3
	DSC	DSC-P-1	DSC: Chemistry, Practical-I	40	10	50	2	-	-	2	2
	DSC			40	10	50	-	-	-	2	2
	DSC			40	10	50	-	-	-	2	2
Total Marks / Credits for First Semester:				560	140	100				23	
II	Language-1	MIL		80	20	100	4	-	-	3	3
	Language-2	MEL		80	20	100	4	-	-	3	3
	CC/CV	AECC		40	10	50	2	-	-	2	2
	DSC	DSC-T-2	DSC-I Chemistry Paper-II	80	20	100	3	-	-	3	3
	DSC	-		80	20	100	3	-	-	3	3
	DSC	-		80	20	100	3	-	-	3	3
	DSC	DSC-P-2	DSC: Chemistry, Practical-II	40	10	50	2	-	-	2	2
	DSC			40	10	50	-	-	-	2	2
	DSC			40	10	50	-	-	-	2	2
Total Marks / Credits for First Semester:				560	140	100				23	
III	Language-1	MIL		80	20	100	4	-	-	3	3
	Language-2	MEL		80	20	100	4	-	-	3	3
	CC/CV	AECC		40	10	50	2	-	-	3	2
	DSC	CHEM-T-3		80	20	100	3	-	-	3	3
	DSC	-		80	20	100	3	-	-	3	3
	DSC	-		80	20	100	3	-	-	3	3
	DSE	Elective		80	20	100	3	-	-	3	3
	DSC	CHEM-P-3		40	10	50	2	-	-	2	2
	DSC			40	10	50	-	-	-	2	2
	DSC			40	10	50	-	-	-	2	2
Total Marks / Credits for First Semester:				560	140	100				24	
IV	Language-1	MIL		80	20	100	4	-	-	3	3
	Language-2	MEL		80	20	100	4	-	-	3	3
	CC/CV	AECC		40	10	50	2	-	-	3	2
	DSC	CHEM-T-4		80	20	100	3	-	-	3	3
	DSC	-		80	20	100	3	-	-	3	3
	DSC	-		80	20	100	3	-	-	3	3
	DSE	Elective		80	20	100	3	-	-	3	3
	DSC	CHEM-P-4		40	10	50	2	-	-	2	2
	DSC			40	10	50	-	-	-	2	2
	DSC			40	10	50	-	-	-	2	2
Total Marks / Credits for First Semester:				560	140	100				24	

1) Language 2) DSC 3) DSC 4) DSC 5) DSC 6) DSC

Course pattern and Scheme of B.Sc. First and Second Semester Examination

Title of the paper	Teaching Hours	Contact hours/Week	Exam. Hours	IA	Marks	Total Marks	Credits
Chemistry-I BCHMT-01	48	3	3	20	80	100	3
Chemistry Practical-I BCHMP-01	40	4	2	10	40	50	2
Chemistry-II BCHMT-02	48	3	3	20	80	100	3
Chemistry Practical-II BCHMP-02	40	4	2	10	40	50	2

Scheme of Internal Assessment Marks : Theory

Sl. No.	Particulars	IA Marks
1	Attendance	05
2	Internal Test (Minimum of Two)	10
3	Assignment / Seminars	05
	Total Theory IA Marks	20

Scheme of Internal Assessment Marks : Practicals

Sl. No.	Particulars	IA Marks
1	Practical Test	05
2	Active participation in Practical classes	05
	Total Theory IA Marks	10

Scheme of Evaluation for Practical Examination

Sl. No.	Particulars	IA Marks
1	Experimental performance	25
2	Procedure Writing	05
3	Record assessment	05
4	Oral performance (Viva-voce)	05
	Total Theory IA Marks	40

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GOVERNMENT COLLEGE (AUTONOMOUS) KALABURAGI

Unit-I

Atomic Structure:

12 hours

Review of Bhor's atomic model. Derivation of expressions for radius, energy and ionization energies of hydrogen and hydrogen like species. Numerical problems. Limitations of classical mechanics. Wave particle duality, de Broglie equation. Uncertainty principle-statement. Quantum numbers (only qualitative): definition and significance. Calculation of k , l , m , and s values for a given values of n (1, 2 and 3). Rules for filling electrons in various orbitals: Aufbau principle and its limitations. Pauli's exclusion principle and Hund's rule maximum multiplicity. Electronic configuration of elements (up to atomic number 30), Stability of half filled and completely filled orbitals. Concept of exchange energy. Relative energy of atomic orbitals. Anomalous electronic configurations.

Periodic Table and Periodic Properties

Review of the modern periodic table (with respect to classification of elements based on outer electronic configuration).

Periodic properties: Atomic and ionic radii, ionization energy electron affinity electronegativity-definitions. Trends in periodic properties-across the period and down the group. Applications in predicting and explaining chemical behavior-reactivity and reducing power, Factors affecting the values of ionization energy. Determination of electro-negativity by Pauling's method, Diagonal relationship and its influence on the properties on beryllium and aluminium.

Comparative study of the elements of alkali and alkaline earths metals, chalcogens and halogens with respect to electronic configuration, atomic and ionic radii, ionization energy and electronegativity, Halides, Oxides and carbonates of alkali and alkaline earth metals. Hydrides of chalcogens and halogens-comparative study of all these with respect to their reactivity,

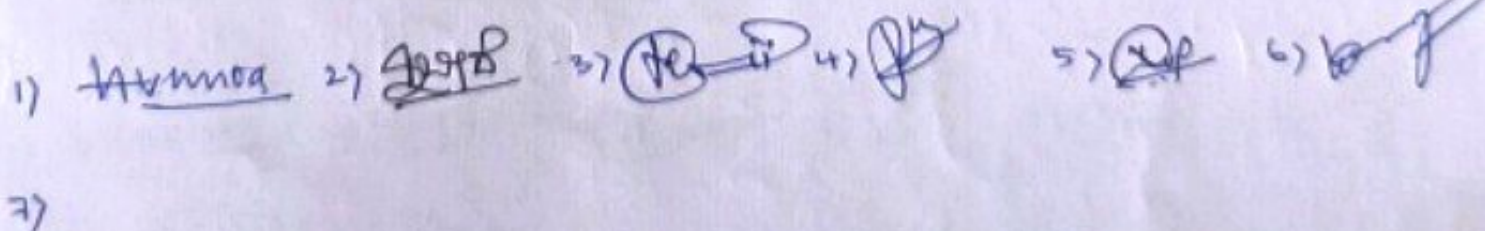
Unit-II

Basic Concept in Organic Chemistry:

12 hours

Bond cleavage - Homolytic and heterolytic- Explanation with examples for each type. Types of reagents: Electrophilic and Nucleophilic reagents-meaning, examples for each type. Reactive intermediates - generation and relative stabilities of carbocation, carbanion, carbon free radicals and carbenes-explanation for relative stability. Introduction to benzyne - stability based on Huckel's rule of aromaticity and generation of benzyne with mechanism.

Types of reactions: addition, substitution and elimination-explanation examples for each type of reaction.



Aliphatic Hydrocarbons:

Alkanes: Preparation of symmetrical and unsymmetrical alkanes, Corey-House reaction and Wurtz reaction-their merits and demerits. Conformational analysis of ethane and n-butane, Sawhorse and newman projection formulae to be used.

Cycloalkanes: Methods of preparation from (i) dichloropropane (2) cyclopentanone, (3) benzene. Explanation for stability based on heat of hydrogenation data. Baeyer's strain theory and its limitations, Sachse -Mohr theory of strainless rings: cyclopropane ring-banana bonds.

Alkenes: Preparation of alkenes by wittig reaction-stereoselectivity. Addition of HX to unsymmetrical alkene - Markownikov's rule and antiMarkownikov's additions with mechanisms. Reactions.: Hydroboration-Oxidation, reduction, oxymercuration-demercuration. Epoxidation-general reactions, with example of ethane (or propene).

Dienes: Classification-isolated, conjugated, cumulated -one example for each type. Structure of allene and butadiene, 1,2-addition and 1,4 addition reactions. Diels Alder reaction: 1,3 butadiene with maleic anhydride as an example.

Alkynes: Methods of preparation: dehydrohalogenation of vicinal and geminal dihalides and higher alkynes from terminal alkynes. Reactions-metal ammonia reduction and its significance.

Unit-III

Liquid and Solutions:

12 hours

Properties of liquids: Viscosity-definition, co-efficient of viscosity, mathematical expression factor affecting viscosity-effect of temperature, size, weight, shape of molecules and intermolecular forces on it. Surface tension-definition, mathematical expression, effect of temperature and solute on surface tension.

Numerical problems on viscosity and surface tension by drop number method.

Liquid Mixture: Review of Raoult's law of dilute solutions, ideal and non-ideal solutions. Completely miscible liquids-theory of fractional distillation of binary liquids with diagram. T-C curves for all the three types, azeotropic mixtures-examples.

Partially miscible liquids: Critical solution temperature-definitions with any one example for each type -explanation with curves (three types). Effect of addition of salt on CST of phenol water system. Immiscible liquids examples. Theory of steam distillation.

Distribution Law: Statement, partition co-efficient and condition for validity of distribution of distribution law. Application of solvent extraction (no derivation).

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Dilute solution Review of colligative properties. Determination of molecular mass of a solute by (i) Barkeley-Hartley method (ΔT_b) (ii) Beckmann's method (ΔT_f) and (iii) Landberger's method. Numerical problems on determination of molar mass. Abnormal molar mas, van't Hoff factor i and significance.

Surface Chemistry:

Theories of adsorption: Adsorption isotherms-Freundlich adsorption isotherm-equation and limitations. Langmuir adsorption isotherm and BET equation (derivation is not included)

Catalysis: Types and theories with examples (intermediate compound theory and adsorptions theory). Heterogeneous catalysis: surface reaction, unimolecular, bimolecular surface reactions, Auto catalysis with example.

Unit-IV

12hrs

Languages of Analytical Chemistry: Definition of analysis, determination, measurement technique and methods. Classification of analytical techniques. Choice of an analytical methods.- accuracy, precision, sensitivity, selectivity, method validation. Figures of merit of analytical methods and limit of detection (LOD), Limit of quantification (LOQ), linear dynamic range (working range).

Errors and treatment of analytical data: Limitations of analytical methods- Errors: Determinate and indeterminate errors, absolute error, relative error, minimization of errors. Statistical treatment of finite sample-mean median, range, standard deviation and variance. External standard calibration-regression equation (least squares method), correlation coefficient (R).

Numerical problems:

Basic laboratory practices, calibration of glassware (pipette, burette and volumetric flask), Sampling (solid and liquid), weighing, drying, dissolving. Acid treatment. Rules of working analytical laboratory, General rule for performing quantitative determinations (volumetric and gravimetric), Safety in Chemical laboratory, Rules of fire prevention accidents,. First aid. Precaution to be taken while handling toxic chemicals, concentrated/fuming acids and organic solvents.

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Chemistry paper-1: Blue Print

Sl.No	Name of Chapter	No. hours	Marks
01	Atomic structure	06	8
02	Periodic table and periodic properties	06	12
03	Basic concepts of organic chemistry	04	6
04	Aliphatic hydrocarbon	08	14
05	Liquids and solution	08	14
06	Surface chemistry	04	6
07	Language of analytical chemistry	04	6
08	Errors and treatment of analytical data	06	10
09	Basic laboratory practices	02	4
	Total	48	80

DSC-1C Chemistry Practicals – I

1. Calibration of glass wares: (i) Pipette (ii) Burette (iii) Volumetric flask.
2. Estimation potassium permanganate using standard oxalic acid solution.
3. Estimation of ferrous ammonium sulphate using standard potassium dichromate solution with diphenyl amine as an internal indicator
4. Estimation of copper using sodium thiosulphate solution
5. Detection of extra elements (N, S, Cl, Br, I) in organic compounds (containing upto two extra elements)
6. Calibration of thermometer.
80-82 °C (Naphthalene) 113.5-114 °C (Acetanilide), 132.5-133 °C (Urea) 100 °C distilled water .
Determination of melting point.
Naphthalene 80-82 °C Benzoic acid 121.5 to 122 °C Urea 132.5-133 °C
Succinic acid 184.5-185 °C m-dinitrobenzene 90 °C P-dichlorobenzene 52 °C, Aspirin 135 °C salicylic acid 132.5-133 °C Acetanilide 157.5-158 °C.
Determination of boiling point.
Ethanol 78 °C, Cyclohexane 81.4 °C, Toluene 110.6 °C, Benzene 80 °C, mixed melting point determination: cinnamic acid mixture in composition (1:4, 1: 1.4) 10
7. Determination of distribution co-efficient of benzoic acid between water and toluene,
8. Determination of distribution coefficient of acetic acid between water and butanol.
9. Determination of density using specific gravity bottle and surface tension of a liquid using Stalagmometer.
10. Determination of density using specific gravity bottle and surface tension of a liquid using stalagmometer.

1) Ammonia 2) Aspirin 3) Aspirin 4) Aspirin 5) Aspirin 6) Aspirin

References:

1. Concise Inorganic Chemistry; J D Lee, 4th Edn, Wiley, (2021)
2. Fundamentals Concepts of Inorganic Chemistry Vol 1 and 2 , 2nd Edition, Asim K Das, CBS Publishers and Distributors, (2013)
3. Basic Inorganic Chemistry, F A Cotton, G Wilkinson and P. L Soni Gaus, 3rd Edition. Wiley India
4. Inorganic Chemistry, 2nd Edn, Catherine E, House craft and A.G. Sharpe, Pearson Prentice Hall (2005)
5. Huheey, J.E Keiter, R. L & Medhi, O. K, Inorganic Chemistry; Principle of Structure and Reactivity, Pearson Education India, 2006
6. Organic Chemistry, B. S Bahl and Arun Bahl, S. Chand and Sons New Delhi
7. Organic Chemistry By S. M Mukherji, S. P Singh and R, K Kapoor (Naros Publishers).
8. Organic Chemistry, Vp;-I and II and III, Jagadambha Singh and L, D, S Yadhav, Pragati Prakshana.
9. Essential of Physical Chemistry, Bahl and Tuli
10. Principle of Physical Chemistry, Puri, Sharma and Phatania.
11. Vogel's Text of quantitative Chemical Analysis, . Mendham. R. C. Denney, J.D. Barnes and M.J.K Thomas, 6th Edition, Third Indian Reprint, Pearson Education Pvt. Ltd (2007).
12. Fundamentals of Analytical Chemistry, D.A. Skoog, D.M. West, Holler and Crouch, 8th Edition, Saunders College Publishing , New York (2005).
13. Analytical Chemistry, G.D Christian, 6th edition, Wiley-India (2007).

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B.Sc. Second Semester
DSC-2C: Chemistry Paper-II

UNIT-I

12hrs

Chemical Bonding: Born-Linde equation (derivation not required, problems on Born-Lande expression to be worked out). Calculation of lattice energies of NaCl and MgO, effect of lattice energy on solubility of ionic compounds.

Covalent bond: Valence bond approach-Postulates of valence bond theory. Hybridization definition and directional characteristics of sp , sp^2 , sp^3 , sp^2d , sp^3d^2 . Formation and Shapes of $BeCl_2$, BF_3 , $SiCl_4$, PCl_5 and SF_6 .

VSEPR theory: Statement, Examples with reference to shapes of CH_4 , NH_3 , NH_4^+ , H_2O , BF_3 and ICl_2 ;

Molecularorbital theory; H_2 , He_2 , Be_2 , N_2 , O_2 , O_2^- , O_2^+ , CO , NO and NO^+ (bond order, stability and magnetic properties to be discussed). Polarization concept: Fajan's rule statement, explanation with examples, bond length, bond angle and bond energy-definitions, unit examples with zero and definite dipole moment values.

Weak interactions: (i) Intra-molecular and Inter-molecular types, examples. Anomalous properties of HF , H_2O , NH_3 and alcohols, carboxylic acids nitrophenols and bimolecularules (ii) vander Waal's forces: Noble gases and molecular crystals (dry ice, iodine and solid SO_2)

Metallic bond: Band theory, electrical properties of metals, semiconductors and insulators.

UNIT-II

Aromatic Hydrocarbons

12hrs

Structure of benzene -using molecular orbital theory. Criteria for aromaticity-Huckel rule, (example: cyclopentadienyl anion, cycloheptatrienyl cation, benzene, naphthalene, anthracene and phenanthrene). Anti-aromaticity: definition, General mechanism of aromatic electrophilic substitution. Mechanism of nitration of benzene including evidence for the formation of nitronium ion. Orienting influence of substituents in toluene, chlorobenzene, nitrobenzene and phenol towards electrophilic substitutions.

1) Ammonia 2) Aspirin 3) Aspirin 4) Aspirin 5) Aspirin 6) Aspirin

Aromatic nucleophilic substitution: Ex: conversion of 2,4 dinitrochlorobenzene to 2,4-dinitrophenyl hydrazine. Birch reduction-statement with an example.

Oxidation of naphthalene to phthalic acid, phthalic anhydride and 1,4-naphthoquinone
Anthracene to anthracene quinone and phenanthrene to phenanthraquinone.

Diels-Alders reaction-statement with an example of the reaction between anthracene with 1,2 dichloroethane.

Alkenyl Benzenes: Styrene, cis and trans stilbenes- structures and their preparations. Biphenyl; preparation by Ullmann reaction.

Organic halogen compounds:

Alkyl halides: Nucleophilic substitution reactions- SN_1 and SN_2 mechanisms with energy profile diagrams. Effect of (i) nature of alkyl groups (ii) nature of leaving groups (iii) nucleophiles and (iv) solvents on SN_1 and SN_2 mechanisms, **Elimination reactions**- E_1 and E_2 mechanisms; Hofmann and Saytzeff eliminations-explanation with mechanism.

Aryl Halides: Preparation by halogenations. Relative reactivity of alkyl, allyl vinyl, aryl and aralkyl halides towards nucleophilic substitution.

UNIT-III

12hrs

Quantum Mechanic

Limitation of classical mechanics. Sinusoidal wave (explain sinusoidal wave) equation (classical wave mechanics); Derivation of time depend Schrodinger wave equation. Postulate of quantum mechanics.

Concept of operators. Significance of: (i) Laplacian operator, (ii) Hamiltonian operator (iii) Eigen values and Eigen functions. Significance of ψ and ψ^2 . Application of Schrödinger equation to the (i) particle in one dimensional box (derivation required).

Radial probability distribution and angular probability distribution curves.
Orbital definition and difference between an orbit with orbital. Nodes or nodal planes. Shapes of s, p and d orbital.

Photochemistry

Laws of photochemistry; Grotthus-Draper law. Stark-Einstein law- Statements, differences between photophysical and photochemical processes-any four differences with examples.

Comparison of photochemical and thermal reactions with an example each.

Quantum yield definition, Magnitude of quantum yield of photochemical combination of (i) H_2 and Cl_2 (ii) H_2 and Br_2 (iii) dissociation of HI (iv) dimerisation of anthracene: reason for low, high and medium quantum yields.

1) Harmon 2) ASPA 3) PK 4) PK 5) PK 6) PK

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Photosensitization-definition with example, photostationary equilibrium- definition and example.

Singlet and triplet states-definitions. Fluorescence, phosphorescence, luminescence, bioluminescence and chemical sensors-definitions of all these with suitable examples.

Beer-Lambert's law statement and its application in colorimetric estimations. Numerical problems; on absorption coefficient and molar extinction coefficient.

UNIT-IV

12hrs

Titrimetric Analysis: Basic principle of titrimetric analysis. Classification, preparation and dilution of reagents/ solution. Normality Molarity and Mole fraction. Use of $N_1V_1 = N_2V_2$ formula, preparation of ppm level solutions from source materials (salt), conversion factors.

Acid-Base Titrimetry: Titration curves for strong acid-strong strong base, weak acid vs strong base and weak base vs strong acid titration. Titration curves, Quantitative applications-selection and standardizing a titrant, inorganic analysis-alkalinity, acidity.

Complexometric titrimetry: Indicators for EDTA titrations-theory of metal ion indicators, titration methods employing EDTA-direct, back, displacement and indirect determinations,. Application-determination of hardness of water.

Redox titrimetry: Balancing redox equations, calculation of the equilibrium constant of redox reactions, titration curves, theory of redox indicators, calculation of standard potentials using Nernst equation, Applications.

Precipitation titrimetry: Titration curves, titrants and standards, indicators for precipitation titrations involving silver nitrate-volhard's and Mohr's methods and their differences.

Gravimetric Analysis: Requisites of precipitation, mechanism of precipitation, Factors influencing precipitation, Co-precipitation, post precipitation, Advantages of organic reagents over inorganic reagents, reagents used in gravimetry (8-hydroxy quinoline (oxine) and dimethyl glyoxime (DMG)) Numerical problems on all the aspects.

1) Ammonia 2) Aspirin 3) Aspirin 4) Aspirin 5) Aspirin 6) Aspirin

Chemistry Paper-II Blue Print

Sl. No	Name of Chapter	No. of hour	Marks
1	Chemical bonding	12	20
2	Aromatic hydrocarbon	08	14
3	Organic halogen compounds	05	06
4	Quantum Mechanic	09	12
5	Photochemistry	04	08
6	Titrimetric analysis	07	14
7	Gravimetric Analysis	03	06
		60	80

DSC-2C: Chemistry Practical – II 60 hours

1. Estimation of zinc in the solution using Standard EDTA
2. Standardisation EDTA solution and estimation of total hardness of sample
3. Determination of Iron in Hemite using standard potassium dichromate solution with diphenyl amine as an internal indicator
4. Estimation of carbonate and bicarbonate in a given mixture
5. Purification of organic compounds by crystallization (from water and alcohol) and distillation
6. Criteria of Purity: Determination of melting and boiling points.
7. Preparation: Mechanism of various reaction involved to discussed.
Recrystallisation. Determination of melting point calculation of quantitative yields to be don
(a) Benzylation amines/phenols
8. Determination of critical solution temperature of phenol-water system.
9. Determination of percentage of sodium chloride solution by finding out the CST of phenol-water system.

1) Amines 2) Quartz 3) Mg 4) Al 5) Ca 6) NaCl

7)

References:

- 1) Concise Inorganic Chemistry: J D Lee, 4th Edn. Wiley, (2021).
- 2) Fundamentals Concepts of Inorganic Chemistry, Vol 1 and 2, 2nd Edition, Asim K Das, CBS Publishers and Distributors, (2013).
- 3) Basic Inorganic Chemistry, F A Cotton, G Wilkinson and P. L. Soni Gaus, 3rd Edition. Wiley India
- 4) Inorganic Chemistry, 2nd Edn, Catherine E, Housecraft and A.G. Sharpe, Pearson Prentice Hall (2005)
- 5) Huheey, J.E Keiter, R. L & Medhi, O. K, Inorganic Chemistry; Principle of Structure and Reactivity, Pearson Education India, 2006
- 6) Text Book of Organic Chemistry by K.S. Tiwari and N.K. Vishnoi.
- 7) Organic Chemistry By S. M Mukherji, S. P Singh and R, K Kapoor (Naros Publishers)
- 8) Organic Chemistry, B.S. and Arun Bahl, S. Chand and Sons, New Delhi.
- 9) Organic Chemistry, Vp;-I and II and III, Jagadambha Singh and L, D, S Yadhav, Pragati Prakshana.
- 10) Essential of Physical Chemistry, Bahl and Tuli
- 11) Principle of Physical Chemistry, Puri, Sharma and Phatania.
- 12) Vogel's Text of quantitative Chemical Analysis, . Mendham. R. C. Denney, J.D. Barnes and M.J.K Thomas, 6th Edition, Third Indian Reprint, Pearson Education Pvt. Ltd (2007).
- 13) Fundamentals of Analytical Chemistry, D.A. Skoog, D.M. West, Holler and Crouch, 8th Edition, Saunders College Publishing , New York (2005).
- 14) Analytical Chemistry, G.D Christian, 6th edition, Wiley-India (2007).

1) Harman 2) Asim 3) Wiley 4) PH 5) Wiley 6) PH

7)

THEORY EXAMINATION QUESTION PAPER PATTERN FOR MAJOR SUBJECTS
(Semester I – VI)

B.Sc. Semester-I Degree Examinations : 2024-25
(Semester Scheme : new Syllabus: 2024-25)

Subject: Science Course

Paper _____ :

Paper Code : _____

Time: 3 Hours

Max. Marks: 80

Instruction to candidates:

- 1) All Sections are compulsory
- 2) Draw neat and labeled diagrams wherever necessary.

SECTION-A

- 1) Answer all the following question: (2×10=20)
- a)
 - b)
 - c)
 - d)
 - e) Minimum TWO question from each unit.
 - f)
 - g)
 - h)
 - i)
 - j)

SECTION-B

- Answer any SIX of the following: (5×6=30)
- 2)
 - 3)
 - 4)
 - 5)
 - 6) Minimum TWO questions from each unit
 - 7)
 - 8)
 - 9)

SECTION-C

- Answer any THREE of the following (10×3=30)
- | | | |
|-----|-------|------------------------|
| 10) | (a+b) | From Unit-I/Unit-I |
| 11) | (a+b) | From Unit-II/Unit-II |
| 12) | (a+b) | From Unit-III/Unit-III |
| 13) | (a+b) | From Unit-IV/Unit-IV |

1) Answer 2) 3) 4) 5) 6) 7)

Course pattern and Scheme of B.Sc. First and Second Semester Examination

Title of the paper	Teaching Hours	Contact hours/Week	Exam. Hours	IA	Marks	Total Marks	Credits
Chemistry-I BCHMT-01	48	3	3	20	80	100	3
Chemistry Practical-I BCHMP-01	40	4	2	10	40	50	2
Chemistry-II BCHMT-02	48	3	3	20	80	100	3
Chemistry Practical-II BCHMP-02	40	4	2	10	40	50	2

Scheme of Internal Assessment Marks : Theory

Sl. No.	Particulars	IA Marks
1	Attendance	05
2	Internal Test (Minimum of Two)	10
3	Assignment / Seminars	05
	Total Theory IA Marks	20

Scheme of Internal Assessment Marks : Practicals

Sl. No.	Particulars	IA Marks
1	Practical Test	05
2	Active participation in Practical classes	05
	Total Theory IA Marks	10

Scheme of Evaluation for Practical Examination

Sl. No.	Particulars	IA Marks
1	Experimental performance	25
2	Procedure Writing	05
3	Record assessment	05
4	Oral performance (Viva-voce)	05
	Total Theory IA Marks	40

1) Attendance 2) 20/20 3) (10/10) 4) 10/10 5) 05/05 6) 05/05