ಗುಲಬರ್ಗಾ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಕಲಬುರಗಿ.

ಜ್ಞಾನ ಗಂಗಾ, ಕಲಬುರಗಿ–585 106, ಕರ್ನಾಟಕ, ಭಾರತ

(ಕರ್ನಾಟಕ ರಾಜ್ಯ ವಿಶ್ವವಿದ್ಯಾಲಯಗಳ ಅಧಿನಿಯಮ 1976ರನ್ವಯ 10–09–1980 ರಂದು ಸ್ಥಾಪಿಸಲಾದ ವಿಶ್ವವಿದ್ಯಾಲಯ ಮತ್ತು 2000ರ ಅಧಿನಿಯಮದ ಅಡಿಯಲ್ಲಿ ಬದಲಾಯಿಸಿದಂತೆ)

ದೂರವಾಣಿ ಸಂ. 08472-263202 ಫ್ಯಾಕ್ಸ್: 08472-263206, ಇ–ಮೇಲ್: registrargug@rediffmail.com

ವಿದ್ಯಾಮಂಡಲ

ಕ್ರ.ಸಂ.ಗುವಿಕ/ವಿಮವಿ/ಬಿಓಎಸ್/2024–25/177 ದಿನಾಂಕ: 23/07/24

ಅಧಿಸೂಚನೆ

ವಿಷಯ: ಸ್ನಾತಕ ಪದವಿ ಕೋರ್ಸಿನ **ರಸಾಯನಶಾಸ್ತ್ರ ವಿಷಯದ** ಪಠ್ಯಕ್ರಮ ಅನುಮೋದಿಸಿ 2024–25ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಜಾರಿಗೊಳಿಸಿದ ಬಗ್ಗೆ.

ಉಲ್ಲೇಖ:1. ಸರ್ಕಾರದ ಆದೇಶ ಸಂಖ್ಯೆ. ಇಡಿ 166 ಯುಎನ್ಇ 2023 ಬೆಂಗಳೂರು, ದಿನಾಂಕ: 08.05.2024
2. ರಸಾಯನಶಾಸ್ತ್ರ ವಿಷಯದ ಸ್ನಾತಕ ಅಧ್ಯಯನ ಮಂಡಳಿಯ ನಿರ್ಣಯ ದಿನಾಂಕ: 15.06.2024
3. ವಿಜ್ಞಾನ ನಿಕಾಯಗಳ ಸಮಿತಿ ಸಭೆಯ ನಿರ್ಣಯ ದಿನಾಂಕ: 11.07.2024
4. ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಅನುಮೋದನೆ ದಿನಾಂಕ: 15.07.2024
5. ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಅನುಮೋದನೆ ದಿನಾಂಕ:19.07.2024

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ಸರ್ಕಾರದ ನಿರ್ದೇಶನದಂತೆ, 2024–25ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಜಾರಿಗೊಳಿಸಿರುವ ಸ್ನಾತಕ ಪದವಿ ಪಠ್ಯಕ್ರಮವನ್ನು ಜಾರಿಗೊಳಿಸಬೇಕಾಗಿರುವ ಪ್ರಯುಕ್ತ **ರಸಾಯನಶಾಸ್ತ್ರ ವಿಷಯದ** ಅಧ್ಯಯನ ಮಂಡಳಿಯು ಪಠ್ಯಕ್ರಮವನ್ನು ಪರಿಷ್ಕರಿಸಿ ಶಿಫಾರಸ್ಸು ಮಾಡಿರುವುದರಿಂದ ಸದರಿ ಪಠ್ಯಕ್ರಮವನ್ನು ವಿಜ್ಞಾನ ನಿಕಾಯದ ಸಭೆಯಲ್ಲಿ ಒಪ್ಪಗೆ ಪಡೆದಿರುವಂತೆ, ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಅನುಮೋದನೆಯಂತೆ ಪದವಿ ಕೋರ್ಸಿನ **ರಸಾಯನಶಾಸ್ತ್ರ ವಿಷಯದ** ಸ್ನಾತಕ ಪಠ್ಯಕ್ರಮವನ್ನು 2024–25ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಅನ್ವಯವಾಗುವಂತೆ ಜಾರಿಗೊಳಿಸಲಾಗಿದೆ.

ಈ ಮಾಹಿತಿಯನ್ನು ಸಂಬಂಧಪಟ್ಟ ಶಿಕ್ಷಕರ ಹಾಗೂ ವಿದ್ಯಾರ್ಥಿಗಳ ಗಮನಕ್ಕೆ ತರಲು ಸೂಚಿಸಲಾಗಿದೆ. ಪಠ್ಯಕ್ರಮದ ವಿವರಗಳನ್ನು ಗುಲಬರ್ಗ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವೆಬ್‌ಸೈಟ್ www.gug.ac.in ದಿಂದ ಪಡೆಯಬಹುದಾಗಿದೆ.

ಕುಲಸಚಿವರು
ಗುಲಬರ್ಗಾ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಕಲಬುರಗಿ

ಗೆ,

1. ಮುಖ್ಯಸ್ಥರು, **ರಸಾಯನಶಾಸ್ತ್ರ ವಿಷಯದ** ವಿಭಾಗ, ಗುಲಬರ್ಗಾ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಕಲಬುರಗಿ.
2. ಎಲ್ಲಾ ಪದವಿ ಕಾಲೇಜುಗಳ ಪ್ರಾಂಶುಪಾಲರುಗಳಿಗೆ.

ಪ್ರತಿಗಳು:

1. ಡೀನ್‌ರು, ಕಲಾ ನಿಕಾಯ, ಗುಲಬರ್ಗಾ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಕಲಬುರಗಿ ರವರ ಮಾಹಿತಿಗಾಗಿ.
2. ಕುಲಸಚಿವರು (ಮೌಲ್ಯಮಾಪನ) ಗುಲಬರ್ಗಾ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಕಲಬುರಗಿ
3. ನಿರ್ದೇಶಕರು, ಪಿಎಂಇಬಿ ಗುಲಬರ್ಗಾ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಕಲಬುರಗಿ ರವರ ಮಾಹಿತಿಗಾಗಿ.
4. ಗ್ರಂಥಪಾಲಕರು, ಗುಲಬರ್ಗಾ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಕಲಬುರಗಿ ರವರ ಮಾಹಿತಿಗಾಗಿ.
5. ವಿಜ್ಞಾನ ನಿಕಾಯದ ಎಲ್ಲಾ ಅಧ್ಯಯನ ವಿಭಾಗಗಳ ಮುಖ್ಯಸ್ಥರಿಗೆ ಗು.ವಿ. ಕಲಬುರಗಿ
6. ಸಂಯೋಜಕರು, ಟಾಸ್ಕ್‌ಫೋರ್ಸ್ ಸಮಿತಿ, ಗುಲಬರ್ಗಾ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಕಲಬುರಗಿ ರವರ ಮಾಹಿತಿಗಾಗಿ.
7. ವಿಶೇಷಾಧಿಕಾರಿಗಳು, ಆಡಳಿತ, ವಿದ್ಯಾಮಂಡಲ, ಪರೀಕ್ಷಾ, ಅಭಿವೃದ್ಧಿ ಗು.ವಿ. ಕಲಬುರಗಿ ರವರ ಮಾಹಿತಿಗಾಗಿ.
8. ಮುಖ್ಯಸ್ಥರು, ಗಣಕ ಕೇಂದ್ರ, ಗು.ವಿ. ಕಲಬುರಗಿ ರವರಿಗೆ ವೆಬ್‌ಸೈಟ್‌ನಲ್ಲಿ ಪ್ರತ್ಯೇಕ ಪೋರ್ಟಲ್‌ನಲ್ಲಿ ಪ್ರಕಟಿಸಲು ಸೂಚಿಸಲಾಗಿದೆ.
9. ನೋಡಲ್ ಅಧಿಕಾರಿಗಳು, UUCMS, ಗು.ವಿ.ಕಲಬುರಗಿ ಇವರ ಮಾಹಿತಿಗಾಗಿ
10. ಕುಲಪತಿಗಳ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿ/ಕುಲಸಚಿವರ ಆಪ್ತ ಸಹಾಯಕರ ಗು.ವಿ. ಕಲಬುರಗಿ ರವರ ಮಾಹಿತಿಗಾಗಿ.

Gulbarga University, Kalaburagi

Bachelor of Science (B.Sc.) Semester Scheme
Three Major Subjects with a General Degree in all Six Semesters

Syllabus (Chemistry: Semester-I & II) for Undergraduate Programmes- 2024-25

as suggested by
Karnataka State Higher Education Council,
Government of Karnataka

Approved by:

Board of Studies in Chemistry (Undergraduate)

Department of Chemistry

Gulbarga University, Kalaburagi

Please upload the syllabi on our University website

16/8/24

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GULBARGA UNIVERSITY

SEP – 2024

Proposed paper titles for Under Graduate Chemistry Papers and Practicals for Semester – I to VI Semester

Semester	Course/Paper code	Title of the Papers	Marks			Teaching			Credits	Examination Duration
			SEM EXAM	IA	Total	L	T	P		
I	DSC- IC	Paper – Chemistry – I	80	20	100	4	-	-	4	3
	DSC- IC	Chemistry Practical - I	40	10	50			2	2	3
II	DSC- 2C	Paper – Chemistry – II	80	20	100	4	-	-	4	3
	DSC- 2C	Chemistry Practical – II	40	10	50			2	2	3
III	DSC- 3C	Paper – Chemistry – III	80	20	100	4	-	-	4	3
	DSC- 3C	Chemistry Practical - III	40	10	50			2	2	3
IV	DSC- 4C	Paper – Chemistry – IV	80	20	100	4	-	-	4	3
	DSC- 4C	Chemistry Practical – IV	40	10	50			2	2	3
V	DSC- 5C	Paper – Chemistry –V	80	20	100	4	-	-	4	3
	DSC- 5C	Chemistry Practical – V	40	10	50			2	2	3
VI	DSC- 6C	Paper – Chemistry – VI	80	20	100	4	-	-	4	3
	DSC- 6C	Chemistry Practical - VI	40	10	50			2	2	3

Practical /Batch = 15 students

*In Semester – III and Semester – IV elective papers are offered. There shall be 02 elective papers offered during each semester (Semester – III and Semester – IV) by every major subject offering Department, where a student shall Choose/select/opt 01 paper out of two to study in each semester (Semester – III and Semester – IV).

15/06/2024

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Distribution of Courses/ Papers in Undergraduates Programme I to VI Semester as per State Education Policy (SEP)
Proposed for B.Sc., Courses

B.Sc., Chemistry: SYLLABUS: (Major with General) effect from 2024-25

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	MIL	Kannada/MIL-1	80	20	100	4	-	-	4	3
	Language	MEL	English-1	80	20	100	4	-	-	4	3
	CC/CV	AECC	Environmental Studies/ Constitutional Values	40	10	50	4	-	-	3	3
	DSC	**CHEMT-1**	**Chemistry Paper-I**	**80**	**20**	**100**	**4**	**-**	**-**	**4**	**3**
	DSC	-	Major-2	80	20	100	4	-	-	4	3
	DSC	-	Major-3	80	20	100	4	-	-	4	3
	DSC	**CHEMP-1**	**Chemistry Practical-I**	**40**	**10**	**50**	**-**	**-**	**4**	**2**	**3**
	DSC	-	Major-2 Practical	40	10	50	-	-	4	2	3
	DSC	-	Major-3 Practical	40	10	50	-	-	4	2	3
Total Marks/ Credits for First Semester:				**560**	**140**	**700**				**29**	
II	Language	MIL	Kannada/MIL-2	80	20	100	4	-	-	4	3
	Language	MEL	English-2	80	20	100	4	-	-	4	3
	CC/CV	AECC	Environmental Studies/ Constitutional Values	40	10	50	4	-	-	3	3
	DSC	**CHEMT-2**	**Chemistry Paper-II**	**80**	**20**	**100**	**4**	**-**	**-**	**4**	**3**
	DSC	-	Major-2	80	20	100	4	-	-	4	3
	DSC	-	Major-3	80	20	100	4	-	-	4	3
	DSC	**CHEMP-2**	**Chemistry Practical-II**	**40**	**10**	**50**	**-**	**-**	**4**	**2**	**3**
	DSC	-	Major-2 Practical	40	10	50	-	-	4	2	3
	DSC	-	Major-3 Practical	40	10	50	-	-	4	2	3
Total Marks/ Credits for Second Semester:				**560**	**140**	**700**				**29**	
III	Language	MIL	Kannada/MIL-3	80	20	100	4	-	-	4	3
	Language	MEL	English-3	80	20	100	4	-	-	4	3
	DSC	**CHEMT-3**	**Chemistry Paper-III**	**80**	**20**	**100**	**4**	**-**	**-**	**4**	**3**
	DSC	-	Major-2	80	20	100	4	-	-	4	3
	DSC	-	Major-3	80	20	100	4	-	-	4	3
	ABC		(NCC/NSS/Sports/Yoga)	40	10	50	3	-	-	2	3
	DSC	**CHEMP-3**	**Chemistry Practical-III**	**40**	**10**	**50**	**-**	**-**	**4**	**2**	**3**
	DSC	-	Major-2 Practical	40	10	50	-	-	4	2	3
	DSC	-	Major-3 Practical	40	10	50	-	-	4	2	3
Total Marks/ Credits for Third Semester:				**600**	**150**	**750**				**28**	
IV	Language	MIL	Kannada/MIL-3	80	20	100	4	-	-	4	3
	Language	MEL	English-3	80	20	100	4	-	-	4	3
	DSC	**CHEMT-4**	**Chemistry Paper-IV**	**80**	**20**	**100**	**4**	**-**	**-**	**4**	**3**
	DSC	-	Major-2	80	20	100	4	-	-	4	3
	DSC	-	Major-3	80	20	100	4	-	-	4	3
	DSE-1	-	Elective-2	40	10	50	3	-	-	2	2
	DSC	**CHEMP-4**	**Chemistry Practical-IV**	**40**	**10**	**50**	**-**	**-**	**4**	**2**	**3**
	DSC	-	Major-2 Practical	40	10	50	-	-	4	2	3
	DSC	-	Major-3 Practical	40	10	50	-	-	4	2	3
	SEC	-	Compulsory /Skill-1	40	10	50	3	-	-	2	4
Total Marks/ Credits for Fourth Semester:				**600**	**150**	**750**				**30**	
V	**DSC**	**CHEMT-5**	**Chemistry Paper-V**	**80**	**20**	**100**	**4**	**-**	**-**	**4**	**3**
	DSC	-	Major-2	80	20	100	4	-	-	4	3
	DSC	-	Major-3	80	20	100	4	-	-	4	3

	DSC	**CHEMP-5**	**Chemistry Practical-V**	**40**	**10**	**50**	-	-	4	2	**3**
	DSC	-	Major-2 Practical	40	10	50	-	-	4	2	3
	DSC	-	Major-3 Practical	40	10	50	-	-	4	2	3
	SEC	-	Compulsory /Skill-2	40	10	50	3	-	-	2	4
Total Marks/ Credits for Fifth Semester				**400**	**100**	**500**				**20**	
VI	**DSC**	**CHEMT-6**	**Chemistry Paper-VI**	**80**	**20**	**100**	**4**	-	-	**4**	**3**
	DSC	-	Major-2	80	20	100	4	-	-	4	3
	DSC	-	Major-3	80	20	100	4	-	-	4	3
	DSC	**CHEMP-6**	**Chemistry Practical-VI**	**40**	**10**	**50**	-	-	4	**2**	**3**
	DSC	-	Major-2 Practical	40	10	50	-	-	4	2	3
	DSC	-	Major-3 Practical	40	10	50	-	-	4	2	3
	SEC	-	Compulsory /Skill-2	40	10	50	3	-	-	2	4
		Total Marks/ Credits for Sixth Semester:		**400**	**100**	**500**				**20**	
		Total Marks/ Credits for the Course		**3120**	**780**	**3900**				**156**	

Note: Course = paper; CC/CV: Compulsory Course/ Constitutional Value; DSC: Discipline Specific Core Course; SEC=Skill Enhancement Course; DSE= Discipline Specific Elective; SEC= Skill Enhancement Courses; ABC= Activity Based Courses, (L= Lecture; T=Tutorial; P= Practical); MIL= Modern Indian Language, MEL – Modern European language

B. Sc. First Semester
DSC – 1C: Chemistry Paper–I

UNIT-I

12 Hours

Atomic Structure

Review of Bohr'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 of maximum multiplicity. Electronic configuration of elements (up to atomic number 30). Stability of half-filled and completely filled orbitals. Concept of exchange energy. Relative energies 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 and electronegativity-definitions. Trends in the 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 electronegativity by Pauling's method. Diagonal relationship and its influence on the properties on beryllium and aluminium.

Comparative study of elements of alkali and alkaline earth metals. Chalcogens and halogens with respect to electronic configuration, atomic and ionic radii, ionisation 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 concepts in organic chemistry 12 **hours**

Nomenclature of organic compounds.

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 and reactivity based on inductive, resonance and hyperconjugative effects. 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.

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Aliphatic Hydrocarbons

Alkanes: Sources, Nomenclature of branched chain 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 –Energy profile diagram.

Cycloalkanes: Nomenclature. Methods of preparation from (1) 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 anti Markownikov's addition with mechanisms. Reactions: Hydroboration-oxidation, reduction, oxymercuration- demercuration, epoxidation-general reactions, with an example of ethane (or propene).

Mechanism of oxidation with $KMnO_4$ and OsO_4. Ozonolysis- mechanism and its importance.

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 germinal dihalides and higher alkynes from terminal alkynes. Reactions-metal ammonia reduction and its significance.

Oxidation with $KMnO_4$, acidic nature of terminal alkynes with example of reaction with ammoniacal solutions of silver nitrate and cuprous chloride.

UNIT-III

Liquids and Solutions **12 hours**

Properties of liquids: Viscosity–definition, co-efficient of viscosity, mathematical expression, factors 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 - explanations with curves (three types). Effect of addition of salt on CST of phenol-water system. Immiscible liquids, examples. Theory of Steam distillation with derivation for the expression of ratio proportion of liquid mixtures and its applications.

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

Dilute solutions: Review of colligative properties. Determination of molecular mass of a solute by (i) Berkeley-Hartley's method (ΔT_b) (ii)Beckmann's method (ΔT_f) and (iii)

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Landsberger's method. Numerical problems on determination of molar mass. Abnormal molar mass, van't Hoff factor *i* and its significance.

Surface chemistry

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

Adsorption indicators: definition and examples. Surface film on liquids-different types.

Catalysis: Types and theories with examples (intermediate compound theory and adsorption theory). Heterogeneous catalysis: surface reactions, unimolecular, bimolecular surface reactions. pH dependence of rate constant of catalysed reactions. Auto catalysis with examples.

UNIT-IV **12 hours**

Language of analytical chemistry: Definitions of analysis, determination, measurement, techniques and methods. Classification of analytical techniques. Choice of an analytical method - 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 samples -mean, median, range, standard deviation and variance. External standard calibration - regression equation (least squares method), correlation coefficient (R^2).

Numerical problems

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

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Chemistry Paper-I: Blue Print

Sl. No.	Name of the chapter	No.of hours	Marks
1	Atomic structure	05	8
2	Periodic table and periodic properties	07	12
3	Basic concepts of organic chemistry	04	6
4	Aliphatic hydrocarbons	08	14
5	Liquids and solutions	08	14
6	Surface chemistry	04	6
7	Language of analytical chemistry	04	6
8	Errors and treatment of analytical data:	05	10
9	Basic laboratory practices	03	4
	Grand total	**48**	80

DSC – 1C : Chemistry Practical - I

1. Calibration of glass wares: (i) Pipettte, (ii) Burette, (iii) Volumetric flask.
2. Estimation of 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 standard 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 ^{0}C(Napthalene), 113.5-114^{0}C (Acetanilide), 132.5-133 ^{0}C (Urea). 100^{0}C (distilled water)

   Determination of melting point.

   Napthalene 80-82 ^{0}C. Benzoic acid 121.5-122 ^{0}C, Urea 132.5-133^{0}C

   Succinic acid 184.5-185 ^{0}C, Cinnamic acid113.5-114 ^{0}C, m-Dinitrobenzene 90 ^{0}C, P-Dichlorobenzene 52 ^{0}C,

   Aspirin 135^{0}C acid 132.5-133 ^{0}C. Salicylic acid 157.5-158 ^{0}C Acetanilide

   Determination of boiling Points :

   Ethanol 78 ^{0}C, Cyclohexane 81.4 ^{0}C , Toluene 110.6 ^{0}C, Benzene 80 ^{0}C,

   Mixed melting point determination : urea – cinnamic acid mixture in composition (1:4, 1:1.4:1)10
7. Determination of distribution coefficient of benzoic acid between water and toluene.

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8. Determination of distribution coefficient of acetic acid between water and butanol.
9. Determination of density using specific gravity bottle and viscosity of a liquid using Ostwald's viscometer.
10. Determination of density using specific gravity bottle and surface tension of a liquid using Stalagmometer.

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. Gaus, 3rd Edition. Wiley. India
4. Inorganic Chemistry, 2nd Edn. Catherine E. Housecroft and A.G. Sharpe, Pearson Prentice Hall (2005)
5. Huheey, J.E., Keiter, E.A., Keiter, R.L. & Medhi, O.K. *Inorganic Chemistry: Principles of Structure and Reactivity*, Pearson Education India, 2006.
6. Organic Chemistry by S. M. Mukherji, S. P. Singh and R. K. Kapoor. (Narosa Publishers)
7. Organic Chemistry, B. S. Bahl and Arun Bahl, S.Chand and sons, New Delhi
8. Organic Chemistry, Vol-I, II and III, Jagadamba Singh and L.D.S. Yadhav, Pragati Prakashan.
9. Essential of Physical Chemistry, Bahl and Tuli
10. Principles of Physical Chemistry, Puri, Sharma and Pathania,
11. Vogel's Textbook of Quantitative Chemical Analysis, J. 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

12 hours

Chemical bonding

Ionic bond: Lattice energy: definition and significance. Born-Haber cycle for NaCl and MgO. Born-Lande 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, BrF_3 and ICl^-.

Molecular orbital theory: H_2, He_2^+, Be_2, N_2, O_2, O_2^-, O_2^{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. Polar and non-polar molecules- examples. Dipole moment-definition, unit, examples with zero and definite dipole moment values.

Weak interactions: (i)Hydrogen bond : Intra-molecular and Inter-molecular types, examples. Anomalous properties of HF, H_2O, NH_3 and alcohols, carboxylic acids, nitrophenols and biomolecules (ii) van-der 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

12 hours

Nomenclature, structure of benzene- using molecular orbital theory. Criteria for aromaticity-Huckel's rule. (examples: 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, energy profile diagram and isotopic effect. Orienting influence of substituents in toluene, chlorobenzene, nitrobenzene and phenol towards electrophilic substitutios reactions.

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

Oxidation of naphthalene to phthalic acid, phthalic anhydride and1,4-napthaquinone Anthracene to anthrax quinone and phenanthrene to phenanthraquinone.

Diels-Alder reaction-statement with an example of the reaction between anthracene with

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1,2-dichloroethene.

Alkenyl benzenes: Styrene, *cis*- and *trans*-stilbenes- structures and their preparations. Biphenyl: Preparation by Ullmann reaction.

Organic halogen compounds

Alkyl halides: Nomenclature. Nucleophilic substitution reactions - S_N1 and S_N2 mechanisms with energy profile diagrams. Effect of (i) nature of alkyl groups (ii) nature of leaving groups (iii) nucleophiles and (iv) solvents on S_N1 and S_N2 mechanisms. Elimination reactions- E1 and E2 mechanisms; Hofmann and Saytzeff eliminations-explanation with mechanism.

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

UNIT -III

Quantum Mechanics **12 hours**

Limitations of classical mechanics. Sinusoidal wave (explain sinusoidal wave) equation (classical wave mechanics); Derivation of time dependent Schrodinger wave equation. Postulates 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 Schrodinger equation to the (i) particle in one dimensional box (derivation required).

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

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.

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

12 Hours

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

Acid-base titrimetry: Titration curves for strong acid vs strong base, weak acid vs strong base

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and weak base vs strong acid titrations. Titration curves, Quantitative applications – selecting 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 above aspects.

Chemistry Paper–II: Blue Print

Sl.No.	Name of the chapter	No. of hours	Marks
1	Chemical bonding	12	20
2	Aromatic hydrocarbons	08	14
3	Organic halogen compounds	05	06
4	Quantum Mechanics	07	12
5	Photochemistry	05	08
6	Titrimetric analysis:	07	14
7	Gravimetric Analysis:	04	06
	Total	48	80

DSC – 2C : Chemistry Practical - II

60 Hours

1. Estimation of zinc in the solution using standard EDTA solution.
2. Standardisation of EDTA solution and the estimation of total hardness of a sample of water.
3. Determination of percentage of iron in haematite 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.

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7. Preparations: Mechanism of various reactions involved to be discussed. Recrystallisation, determination of melting point and calculation of quantitative yields to be done.
   (a) Benzoylation of 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.
10. Determination of critical solution temperature of phenol-water system.
11. Determination of percentage of sodium chloride solution by finding out the CST of phenol-water system

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)
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13. Fundamentals of Analytical Chemistry, D.A. Skoog, D.M. West, Holler and Crouch, 8th edition, Saunders College Publishing, New York (2005).
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THEORY EXAMIANTION 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

Instructions to candidates:

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

SECTION – A

1. Answer all the following questions : (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.

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SECTION – C

Answer Any Three of the Following : (10 x3 = 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

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