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 ಬದಲಾಯಿಸಲಾದಂತೆ)

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

ವಿದ್ಯಾಮಂಡಲ

ಕ್ರ.ಸಂ.ಗುವಿಕ/ವಿಮವಿ/ಬಿಓಎಸ್/2023-24/ 428 ದಿನಾಂಕ: 09.11.23

ಅಧಿಸೂಚನೆ

ವಿಷಯ: ಸ್ನಾತಕ ಪದವಿ ಕೋರ್ಸಿನ **ರಸಯನಶಾಸ್ತ್ರ ವಿಷಯದ** ಐದನೇ ಹಾಗೂ ಆರನೇ ಸೆಮೇಸ್ಟರ್ ಪಠ್ಯಕ್ರಮ ಅನುಮೋದಿಸಿ 2023–24ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಜಾರಿಗೊಳಿಸಿದ ಬಗ್ಗೆ.

ಉಲ್ಲೇಖ:1. ಸರ್ಕಾರದ ಆದೇಶ ಸಂಖ್ಯೆ. ಇಡಿ 104 ಯುಎನ್ಇ 2023 ಬೆಂಗಳೂರು, ದಿನಾಂಕ:20.07.2023

2. ರಸಯನಶಾಸ್ತ್ರ ವಿಷಯದ ಸ್ನಾತಕ ಅಧ್ಯಯನ ಮಂಡಳಿಯ ನಿರ್ಣಯ ದಿನಾಂಕ: 20.09.2023.

3. ವಿಜ್ಞಾನ ನಿಕಾಯಗಳ ಸಮಿತಿ ಸಭೆಯ ನಿರ್ಣಯ ದಿನಾಂಕ: 06.11.2023

4. ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಅನುಮೋದನೆ ದಿನಾಂಕ: 08.11.2023

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ಸರ್ಕಾರದ ನಿರ್ದೇಶನದಂತೆ, 2023–24ನೇ ಶೈಕ್ಷಣಿಕ ಪ್ರಸಕ್ತ ಸಾಲಿನಿಂದ ಜಾರಿಗೊಳಿಸಿರುವ ಸ್ನಾತಕ ಪದವಿ ಐದನೇ ಮತ್ತು ಆರನೇ ಸೆಮಿಸ್ಟರ್ ಪಠ್ಯಕ್ರಮವನ್ನು ಜಾರಿಗೊಳಿಸಬೇಕಾಗಿರುವ ಪ್ರಯುಕ್ತ **ರಸಯನಶಾಸ್ತ್ರ ವಿಷಯದ** ಅಧ್ಯಯನ ಮಂಡಳಿಯು ಪಠ್ಯಕ್ರಮವನ್ನು ಪರಿಷ್ಕರಿಸಿ ಶಿಫಾರಸ್ಸು ಮಾಡಿರುವುದರಿಂದ ಸದರಿ ಪಠ್ಯಕ್ರಮವನ್ನು ವಿಜ್ಞಾನ ನಿಕಾಯದ ಸಭೆಯಲ್ಲಿ ಒಪ್ಪಗೆ ಪಡೆದಿರುವಂತೆ, ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಘಟನೋತ್ತರ ಅನುಮೋದನೆಯನ್ನು ನಿರೀಕ್ಷಿಸಿ ಸದರಿ ಪಠ್ಯಕ್ರಮವನ್ನು ಪ್ರಸ್ತುತ ಸ್ನಾತಕ ಪದವಿ ಕೋರ್ಸಿನ **ರಸಯನಶಾಸ್ತ್ರ ವಿಷಯದ** ಐದನೇ ಮತ್ತು ಆರನೇ ಸೆಮೆಸ್ಟರ್ 2023–24ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಅನ್ವಯವಾಗುವಂತೆ ಜಾರಿಗೊಳೀಸಲಾಗಿದೆ.

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

ಕುಲಸಚಿವರು 08.11.23

ಗುಲಬರ್ಗಾ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಕಲಬುರಗಿ.

ಗೆ,

1. ಮುಖ್ಯಸ್ಥರು, **ರಸಯನಶಾಸ್ತ್ರ ಅಧ್ಯಯನ** ವಿಭಾಗ, ಗುಲಬರ್ಗಾ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಕಲಬುರಗಿ.
2. ಎಲ್ಲಾ ಪದವಿ ಕಾಲೇಜುಗಳ ಪ್ರಾಂಶುಪಾಲರುಗಳಿಗೆ.

ಪ್ರತಿಗಳು:

1. ಡೀನ್‌ರು, ವಿಜ್ಞಾನ 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

Bachelors of Science (B.Sc.)

Chemistry Syllabus
(With Effect from 2023-24)

SEMESTER V

DISCIPLINE SPECIFIC COURSE (DSC)
and
SKILL ENHANCEMENT COURSE (SEC)

(AS PER NEP – 2020)

(1)

Gulbarga University
Department of Chemistry
B.Sc. Chemistry V & VI Semester Syllabus – 2023-2024 (NEP)

Sem.	Type of Course	Course Title	Instruction hour/week	Total hours / sem	Duration Of Exam	Marks			Credits
						Formative	Summative	Total	
V	DSC-9	Inorganic Chemistry (Theory) -IX	04hrs	60	02hrs	40	60	100	04
	DSC-10	Inorganic Chemistry (Practical) - X	04hrs	60	03hrs	25	25	50	02
	DSC-11	Organic Chemistry (Theory) -XI	04hrs	60	02hrs	40	60	100	04
	DSC-12	Organic Chemistry (Practical) - XII	04hrs	60	03hrs	25	25	50	02
	Other subject								04
	Other subject								04
	Other subject								04
	SEC-3	**Employability skills in Chemistry/ Cyber Security**	04hrs	60	03hrs	25	25	50	2/3
		Total							**26/27**
VI	DSC-13	Physical Chemistry (Theory) -XIII	04hrs	60	02hrs	40	60	100	04
	DSC-14	Physical Chemistry (Practical) - XIV	04hrs	60	03hrs	25	25	50	02
	DSC-15	Spectroscopy (Theory) -XV	04hrs	60	02hrs	40	60	100	04
	DSC-16	Analytical and Organic Chemistry (Practical) - XVI	04hrs	60	03hrs	25	25	50	02
	Other subject								04
	Other subject								04
	Other subject								04
	Internship-1	**Chemistry Internship**	04hrs	90		50	-	50	02
		Total							**26**

Theory and Practicals (B.Sc. in Chemistry V Semester)

DSC - 09 : Selected Topics in Inorganic Chemistry- IIIDSC - 10 : Inorganic Chemistry Practicals
DSC - 11 : Selected Topics in Organic Chemistry- IIIDSC - 12 : Organic Chemistry Practicals

Theory and Practicals (B.Sc. in Chemistry VI Semester)

DSC - 13 : Selected Topics in Physical Chemistry- IIIDSC - 14 : Physical Chemistry Practicals
DSC - 15 : Spectroscopy
DSC - 16 : Analytical and Industrial Chemistry Practicals

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Gulbarga University, Kalaburagi
B.Sc. Chemistry

Programme Specific Outcomes (PSO):

On completion of the 03 years Degree in Chemistry students will be able to:

- Demonstrate, solve and understand the major concepts in all the disciplines of chemistry.
- Provide students with broad and balanced knowledge and understanding of key chemical concepts.
- Understand practical skills so that they can understand and assess risks and work safely and competently in the laboratory.
- To apply standard methodology to the solutions of problems in chemistry.
- Provide students with knowledge and skill towards employment or higher education in chemistry or multi-disciplinary areas involving chemistry.
- Provide students with the ability to plan and carry out experiments independently and assess the significance of outcomes.
- Develop in students the ability to adapt and apply methodology to the solution of unfamiliar types of problems.
- Employ critical thinking and the scientific knowledge to design, carry out, record and analyze the results of chemical reactions.
- To prepare students effectively for professional employment or doctoral degrees in chemical sciences.
- To cater to the demands of chemical industries of well-trained graduates.
- To build confidence in the candidate to be able to work on his own in industry and institution of higher education.
- To develop an independent and responsible work ethics.

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B.Sc. Semester–V

Discipline Specific Course (DSC) -9

Course Title: Inorganic Chemistry (Theory) : III

Type of Course	Theory /Practical	Credits	Instruction hour per week	Total No.of Lectures/Hours /Semester	Duration of Exam	Formative Assessment Marks	Summative assessment Marks	Total Marks
DSC-9	**Theory**	**04**	**04**	**60 hrs.**	**2hrs.**	**40**	**60**	**100**

Course Outcomes (COs): At the end of the course students will be able to:

1: Explain theory of coordination compounds, IUPAC system of nomenclature, calculation of EAN, Isomerism in coordination compounds and Valence bond theory

2: Understand Metal carbonyls: Types, nomenclature, preparation, and properties. 18 electron rule, Structure of mononuclear and binuclear carbonyls using VBT, Preparation and structure of methyl lithium, Zeiss salt and ferrocene and industrial applications of organometallic compounds.

3: Understand Crystal field theory, crystal field splitting, calculation and comparison of CFSE in octahedral, tetragonal, tetrahedral and square planar complexes.

4 : Study the Stability of metal complexes (thermodynamic and kinetic), stepwise and overall stability constant and their relationship. Factors affecting the stability of metal complexes.

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Gulbarga University
Department of Chemistry
B.Sc. Chemistry V & VI Semester Syllabus – 2023-2024 (NEP)
B.Sc. Course Pattern and Scheme of Examination under NEP approved by UG-BOS in Chemistry held on 20-09-2023.

DISCIPLINE SPECIFIC COURSE: SEMESTER - V

DSC-9: Inorganic Chemistry-III:

Theory-60 hours

UNIT-I: **15 hours**

Chemical Bonding- VSEPR model, shapes of molecules; ICl_4^-, TeF_5^-, $TeCl_6^{2-}$, XeF_6, $SbCl_6^{3-}$, ReF_7, XeF_8^{2-}, TaF_8^{3-}; Bent rules and energetics of hybridization; electronegativity and partial ionic character; Bonds- Multicenter, Synergic and Agostic bonding. Lattice energy: Born-Lande equation, Kapustinskii equation; polarizability and partial covalent character, radius-ratio rules, structures of simple solids, Zintl-isoelectronic relationship in solids. Molecular orbital theory: LCAO and MO diagrams of heteronuclear diatomic (CO, NO. HF, ICl) and triatomic molecules (CO_2 and NO_2^-).

UNIT-II: **15 hours**

Chemistry of main group elements- Structure and bonding in boranes, carboranes, metallocarboranes, Wades rules, borazines, phosphazenes, S,N- compounds. Silicates- Classification, structures, isomorphous replacement, pyroxenes, layered and vitreous silicates, zeolites and molecular sieves. HSAB concept: Basis of HSAB concept, acid-base strength, hardness and softness, symbiosis, applications of HSAB concept; Acid- base concept in non-aqueous media, reactions in BrF3, N2O4, anhydrous H2SO4, CH3COOH. Isopoly and heteropoly acids of W, Mo and V, preparations, properties, structure and applications. Stereoisomerism- Chirality, optical activity- CD, ORD, Cotton effect, absolute configuration of metal complexes, magnetic circular dichroism.

UNIT-III: **15 hours**

M-M bond and metal atom clusters, halide clusters, bonding in $[ReCl_8]^{2-}$. Metal carbonyl clusters-LNCC's and HNCC's. Electron counting in carbonyl clusters, Wades-Mingos and Lauher rules.

Nuclear Chemistry-The atomic nucleus-elementary particles, quarks, classification of nuclides based on Z and N values, nuclear stability, nuclear potential, binding energy. Nuclear Models: Shell model-salient features, forms of the nuclear potential, filling of orbitals, nuclear configuration, Liquid drop model, Fermi gas model, Collective model and Optical model. Radioactivity, radioactive decay kinetics, Parent-daughter decay-growth relationship-secular and transient equilibria, theories of α, β^-, β^+ and γ-decay, internal conversion, Auger effect.

UNIT-IV: **15 Hours**

Co-ordination Chemistry: Double salts, complex salts, definition of terms-complex ion, ligand, co-ordination number, coordination sphere. Types of ligands with example-monodentate, bidentate, polydentate, Ambidentate and macro cyclic ligands (crown ethers, porphyrins). Methods of detection of complex formation- conductivity, pH, colour, EAN rule for stabilizing of complexes. Nomenclature of complex compounds. Isomerism in complex compounds: a) Structural isomerism-Ionization isomerism, hydrate isomerism, linkage isomerism and coordinate isomerism, b) Optical and geometrical isomerism in complex compounds with coordination number 4 and 6.

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Applications of complex formation in (a) Metallurgy (in the extraction of nickel and gold) (b) Qualitative and quantitative analysis.

Valance Bond Theory (VBT): Valence bond theory as applied to complexes- inner and outer orbital complexes. The structure and geometry of the following complexes to be discussed: $[Fe(CN)_6]^{2-}$, $[Fe(H_2O)_6]^{2+}$, $[MnCl_4]^{2-}$, $[Ni(CO)_4]^{2-}$, $[Cu(NH_3))_4]^{2+}$.

Modification of VBT: Electroneutrality principle of $[Be(H_2O)]^{2+}$ and back bonding effect with respect to $[Ni(CO)_4]^{2-}$.

Crystal Field Theory (CFT): Splitting of d-orbitals in octahedral and tetrahedral fields, effect of weak and strong field ligands, spectrochemical series of ligands, crystal field stabilization energy and calculation of CFSE for different systems.

References:

1. Advanced Inorganic Chemistry, 6th edition; F.A. Cotton and G. Wilkinson.
2. Inorganic Chemistry IV edition; J.E. Huheey, E.A. Keiter and R. L. Keiter, Addison; Wesley (1993).
3. Inorganic Chemistry, II edition, D.F. Shriver, P.W. Atkins and C.H. Langford, ELBS; Oxford University Press, 1994.
4. Chemistry of elements; N.N. Greenwood and A.E. Earnshaw, Butterworth Heinemann (1997).
5. Concise Inorganic Chemistry, 5th edition; J.D. Lee (1996).
6. Essentials of nuclear chemistry, 4th edition; H.J. Arniker, NAIL publishers (1995).
7. Nuclear and Radioactive chemistry; Friedlander, Kennedy and Miller.
8. Inorganic Chemistry, 3rd Edition; Gary. L. Miessler and Donald. A. Tarr (2007).
9. Principles of Inorganic Chemistry (UGC Syllabus), B.R. Puri, L.R. Sharma, K.C. Kalia, Milestone Publishers, New Delhi, India, 2008.
10. Advanced Inorganic Chemistry by Gurudeep Raj and Chatwal Anand.
11. Modern Inorganic Chemistry by R.D. Madan.
12. Advanced Inorganic Chemistry by Sathyaprakash.

Formative Assessment for Theory	
Assessment Occasion/type	**Marks**
Internal Assessment Test 1	10
Internal Assessment Test 2	10
Quiz/Assignment/Small Project	10
Seminar	10
Total	**40 Marks**
Formative Assessment as per guidelines.	

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B.Sc. Semester–V

Discipline Specific Course (DSC)-10

Course Title: Inorganic Chemistry Practical:

Type of Course	Theory /Practical	Credits	Instruction hour per week	Total No.of Lectures/Hours /Semester	Duration of Exam	Formative Assessment Marks	Summative assessment Marks	Total Marks
DSC-10	**Practical**	**02**	**04**	**60 hrs.**	**3hrs.**	**25**	**25**	**50**

Course Outcomes (COs):At the end of the course, students will be able to:

1: Perform the various steps involved in Gravimetric Analysis of metal ions.

1. Gravimetric Analysis:

1. Determination of barium as $BaSO_4$.
2. Deter mination of iron as Fe_2O_3
3. Determination of aluminum as Al_2O_3
4. Determination of aluminum (III) using oxine .
5. Separation of Fe (II) and Ni (II) from the solution. Determination of Fe (II) gravimetrically and Ni (II) volumetrically.
6. Separation of Fe (II) and Ni (II) from the solution. Determination of Ni (II) gravimetrically and Fe(II) volumetrically.

2. To Learn the skills of Preparation of Coordination complexes

Examination

In a batch of ten students in the practical examination, five students may be given Semi micro qualitative analysis and other five students may be given gravimetric estimation. Selection of experiments may be done by the students based on the picking up of chits. Viva questions may be asked on any of the experiments prescribed in the practical syllabus.

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DSC-10: Inorganic Chemistry Practical:

PART-A: Gravimetric and Volumetric Analysis

1. Gravimetric determination of Fe in iron ore as Fe_2O_3.
2. Gravimetric estimation of calcium as calcium oxide.
3. Gravimetric estimation of aluminum as aluminum oxide.
4. Gravimetric estimation of magnesium as magnesium-oxinate.
5. Gravimetric determination of Ni using DMG in Cu and Ni solution.
6. Gravimetric determination of Fe using NH_4OH in Fe and Cr solution.
7. Gravimetric estimation of Cu using NH_4SCN in Cu and Zn solution.
8. Volumetric estimation of Ca and Mg in dolomite solution.
9. Volumetric estimation of Fe in Cu and Fe solution.

PART-B: Preparation of co-ordination complexes

1. Preparation of hexamminenickel(III) chloride.
2. Preparation of chloropentaminecobalt(III)chloride.
3. Preparation of tris(oxalato)ferrate(III).
4. Preparation of hexamminecobalt(III)chloride(demonstration).
5. Preparation of mercury tetrathiocyantocobaltate(II) (demonstration).
6. Preparation of trans-potassium diaquadioxalatochromate (III).
7. Preparation of tris(thiourea) copper (I) sulphate monohydrate
8. Preparationofpentamminechlorocobalt(III)chloride.

Distribution of Marks:

Gravimetric Determination:

Accuracy-12marks, Technique and Presentation-2marks Calculation and reactions 3 marks, Journal-3 marks, Viva-Voce-5 marks, Total=25 marks.

Deduction of Marks for accuracy:

±6mg -12 marks, ± 8mg-10 marks, ±10mg -8 marks, ±12mg-06 marks, ±14mg-04 marks, ±16mg-02marks, above ±16 mg -zero marks.

Books recommended:

1. Vogel's Qualitative and quantitative Inorganic Analysis, G. Svehla, 7th Ed, Longman (2001).
2. Advanced Practical Chemistry, Pragathi, Publications, Jagadamba Singh,
3. Advanced Practical Inorganic Chemistry, Gurdeep Raj, Goel Publishing House, Meerut

Note: *The list of experiments is suggestive. However, faculties / academic bodies may add more experiments / references or incorporate suitable revisions based on infrastructure facilities available at the Institution.*

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B.Sc. Semester–V

Discipline Specific Course(DSC)-11

Course Title: Organic Chemistry (Theory) : III

Type of Course	Theory /Practical	Credits	Instruction hour per week	Total No.of Lectures/Hours /Semester	Duration of Exam	Formative Assessment Marks	Summative assessment Marks	Total Marks
DSC-11	**Theory**	**04**	**04**	**60hrs.**	**2hrs.**	**40**	**60**	**100**

Course Outcomes (COs): At the end of the course, students will be able to:

1: Study aromaticity of 5-membered and six member rings containing one hetero atom, synthesis of pyrrole, furan, pyridine, mechanism of electrophilic substitution reactions of furan, pyrrole and pyridine. Indole, quinoline and isoquinoline.

2: Describe constitution of hygrine, coniine and nicotine. Classification and biological significance, source and structure of Vitamin A, Vit-B1, B2, B6, K1 and C and functions and diseases by the deficiency of hormones

3: Learn the structure and constitution of Carbohydrates, Ring Size determination and properties, Structures of Disccharides and polysaccharides and Biological importance.

4: Study the classification of amino acids, stereochemistry of amino acids. Zwitter ion and explanation to isoelectric point, Synthesis of amino acids and diptides, biological importance, primary, secondary structure of proteins (α-helical, β-sheet), classification, isoprene rule, special isoprene rule constitution and synthesis of citral and α-terpinol.

DSC-11: Organic Chemistry-III:

Theory-60 hours

UNIT-I: **15 hours**

Alcohols: (8 hours)

Monohydric alcohol:- Classification, nomenclature, preparation from alky halides, aldehydes, ketones. Distinguish test between 1°, 2°, 3° alcohols by Victor-Meyer method, Lucas method. Test for hydroxyl alcohol- formation of alkoxide, esterification with mechanism, oxidation.

Dihydric alcohol:- Nomenclature, preparation of glycol from alkene. Oxidative cleavage using lead tetra acetate, periodic acid.Uses of ethylene glycol.

Trihydric alcohol:- Nomenclature, manufacture of glycol from Spent lye. Synthesis from propene. Reactions of glycol with oxalic acid at different temperatures, reaction with PCl_5, with fatty acids. Uses of glycerol, preparation of nitroglycerine, composition and uses of Cordite and dynamite.

Phenols: (7 hours)

Classification, nomenclature, Methods of preparation from Cumene, Dow process, from diazonium salts.Acidity of phenols- resonance, stabilization of phenoxide ion, compare the acidity of alcohol and phenol. Effect of substituent's on acidity of phenols, electron withdrawing groups (-NO_2, -Cl, -CN, -CHO, -COOH), electron donating groups (-CH_3, -OCH_3, -NH_2).

Reactions of phenols. Fries, Claisen, Reimerr-Tiemann, Leader-Manase reactions with mechanism.Synthesis of phenolphthalein, salicylaldehyde, vanillin, o-benzoquinone.

Unit-II: **15 hours**

Aldehydes and Ketones: (5 hours)

Nomenclature. Structure and reactivity of carbonyl groups in aldehydes, ketones.

Reactions of aldehydes and ketones with hydroxyl amine, hydrogen cyanide, 2,4-DNP. Reaction Mechanism of Aldol, Perkin's, Benzoin, Cannizaro, Knoevenagel reaction. Clemmenson reduction, Wolff-Kishner reduction.

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Rearrangements: (5 hours)
Wolff, Hofmann, Curtius, Lossen and Schmidt rearrangements. Benzil-benzilic acid rearrangement. Stevens, Wittig and Favorskii rearrangements, Baeyer-Villiger oxidation. Neberre arrangement. Benzidine rearrangement.

Amino acids and proteins: (5 hours)
Definitions and classification of amino acids, synthesis of amino acids by Gabriel phthalimide, malonic ester and Strecker's method of synthesis.
Properties and reactions- Zwitter ion and isoelectric points. Ninhydrin and Biuret tests.
Peptides: peptide bond, carbobenzoxy method of synthesis of peptides.
Proteins: Classification based on composition and structure: primary and secondary structures of proteins. Denaturation of proteins.

UNIT-III: **15 hours**

Stereochemistry: (6 hours)
Walden inversion, asymmetric synthesis.Geometrical isomerism: Geometric isomerism in maleic acid and fumaric acid. Determination of their configurations. Geometrical isomerism of oximes, Determination of configuration of oximes. Beckmann rearrangement.
Conformational analysis: Conformational analysis of cycloalkanes : cyclobutane, cyclopentane, cyclohexanes (monosubstituted e.g., methyl, iso-propyl, tert-butyl and di-substituted cyclohexanes e.g., dialkyl, dihalo, diols), and cycloheptane.

Carbohydrates: (6 hours)
Introduction, Kiliani-Fischer synthesis, Determination of configuration of the monosaccharides, conformational analysis of monosaccharides. Synthesis of amino sugars (β-D-Glucosamine, galactosamine, N-acetylmuramic acid (NAMA), N-acetylneuraminic acid NANA). C-and N-glycosides. Synthesis of aldonic, uronic, aldaric acids and alditols. Structure elucidation of sucrose and maltose. Structures of lactose, gentiobiose, and meliobiose. Photosynthesis of carbohydrates.

Retrosynthesis: (3 hours)
Retrosynthesis of benzocaine, 4-methoxy acetophenone, saccharin. Disconnection approach. General terms: synthon, synthetic equivalents and target molecule. General guidelines for disconnection.

Unit-IV: **15 hours**

Heterocycliccompounds:
Nomenclature of heterocyclic compounds. Preparation and reactions of pyrrole, furan, thiophene, indole, pyridine, quinoline, isoquinoline. Aromaticity of pyrrole, furan, thiophene. Basicity of pyrrole and pyridine.
Structure, reactivity, synthesis and reactions of pyrazole, imidazole, oxazole, isoxazole, thiazole, isothiazole, pyrimidine, purine. Preparation and reactions of coumarins, acridines, cinnolenes and quinoxalines.

Formative Assessment for Theory	
Assessment Occasion/type	**Marks**
Internal Assessment Test 1	10
Internal Assessment Test 2	10
Quiz/Assignment/Small Project	10
Seminar	10
Total	**40 Marks**
Formative Assessment as per guidelines.	

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References:

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2. Advanced Organic Chemistry, FA Carey and RJ Sundberg Plenum,(1990).
3. A Guide Book to Mechanismin Organic Chemistry, Peter Sykes, Longman, (2000).
4. Structure and mechanism of Organic Chemistry, CK Ingold, Cornell University Press (1999).
5. Organic Chemistry, RT Morrison and RN Boyd, Prentice-Hall, (1998).
6. Modern Organic Reactions, HO House, Benjamin, (1972).
7. Principles of Organic Synthesis, ROC Norman and JM Coxon, Blackie Academic and Professional, (1996).
8. Stereochemistry of Organic Compounds, D Nasipuri, New-Age International, (1999).
9. Stereochemistry of Carbon Compounds, ELEliel, SH Wilenand LN Mander, JohnWiley, (1994).
10. Stereochemistry,Potapov, MIR, Moscow,1984.
11. Organic Chemistry, Volumes I and II, IL Finar, Longman,(1999).
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13. Organic Chemistry, R. T. Morrison and R. N. Boyd, VI Edition, Printice-Hall of India Limited, New Delhi, 1992.
14. Organic Chemistry, B. Y. Paula, III Edition, Pearson Education, Inc.(Singapore), New Delhi, reprint, 2002.
15. Textbook of Organic Chemistry, P S Kalsi, Mac Millan, 2000.

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B.Sc. Semester–V

Discipline Specific Course (DSC) -12

Course Title: Organic Chemistry (Practical)

Type of Course	Theory /Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours /Semester	Duration of Exam	Formative Assessment Marks	Summative assessment Marks	Total Marks
DSC-12	**Practical**	**02**	**04**	**60 hrs.**	**3hrs.**	**25**	**25**	**50**

Course Outcomes (COs): At the end of the course, students will be able to:

1: Learn the skills of the preparation of Organic Compounds
2: Acquire the Knowledge of Analysis of mixtures

DSC-12 : ORGANICCHEMISTRY PRACTICALS

PART-A : Preparation (one stage)

1. Cannizarroreaction: Benzaldehyde.
2. Friedel-Craftsreaction: Benzeneand Acetylchloride.
3. Sandmeyerreaction: 4-Chlorotoluene from 4-toluidine.
4. Pechmannreaction: Resorcinol and ethylacetoacetate.
5. Oxidation of Cyclohexanol.
6. Preparation of S-Benzylisothiuronium chloride.
7. Synthesis of p-iodonitrobenzene
8. Synthesis of N-Phenyl-2,4-dinitroaniline.
9. Synthesis of 2,4,6-tribromoaniline.
10. Synthesis of 2,4-dichlorophenoxy acetic acid.

PART-B : Organic Qualitative analysis of binary mixture containing two solid compounds, separation using $NaHCO_3$, NaOH and HCl. Identification of mixture, separation of mixture and analysis of any one component Acids-Benzoic, Salicylic, Cinnamic and phthalic acid.

Phenols:- 1-Naphthol, 2-Naphtholand and resorcinol.

Bases:-P-Toluidine.O- Toludine, m-Toludine, Nitro anilines

Neutral:-Naphthalene, Diphenyl, m-dinitrobenzene, Acetanilide.

The mixture is of A+B, A+N, P+B, P+N and B+N

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Note: *The list of experiments is suggestive. However, faculties / academic bodies may add more experiments / references or incorporate suitable revisions based on infrastructure facilities available at the Institution. Any Five Preparations and Five Solid Binary Mixtures has to be carried out.*

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B.Sc. Semester – V

Skill Enhancement Course: SEC-3

Course Title: Employability skills in Chemistry

Type of Course	Theory / Practical	Credits	Instruction hour/ week	Total No. of Lectures/Hours / Semester	Durationof Exam	Formative Assessment Marks	Summative assessment Marks	Total Marks
SEC-3	**Practical**	**02**	**04**	**60 hrs.**	**3hrs.**	**25**	**25**	**50**

Employability skills in chemistry will have Paper A, B and C. Students will choose experiments either from Paper A or B or C but not mixture of all. Principal of the college can also suggest the selection of Paper based on availability of Chemicals, instruments etc.

Paper A: Separation technique and pharmaceutical analysis

1. Separation of amino acids by paper chromatography and measuring R_f values.
2. Separation of Sudan yellow and Sudan red in the mixture by Thin Layer Chromatographic technique
3. Separation of Cu^{2+}, Co^{2+} and Ni^{2+} by Paper chromatographic method
4. Separation of Al^{3+}, Fe^{3+} and Zn^{2+} by Paper chromatographic method
5. Separation of o - and p - nitro anilines in a mixture by column chromatographic method
6. Separation of leaf pigments by column chromatography.
7. Determination of aspirin present in aspirin tablet conductometrically.
8. Determination cholesterol colorimetrically
9. Determination of proteins colorometrically using biuret reagent
10. Determination of amino acids colorimetrically using ninhydrin
11. Determination of Glucose /Sucrose colourimetrically using Fehling's Solution

Paper B: Industrial Chemistry

1. Analysis of Cement.
2. Determination of calcium in CAN fertilizer.
3. Determination of Ca and Mg in dolomite by complexometric titration method
4. Preparation of phenol formaldehyde Resin.
5. Preparation of urea formaldehyde resin.
6. Nitration of salicylic acid by green method (Using calcium nitrate and acetic acid).

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7. Preparation of aspirin from salicylic acid.

8. Determination sulfate by Turbidity method / TDS of water
9. Study of food adulteration in Tea Powder, Coffee Powder, turmeric powder, Chilli Powder, oil / fat, milk, etc.
10. IR peak analysis for Functional groups using recoded IR Spectra

Paper C: Soil and Water Analysis (With effect from 2024-25 and onwards)

1. Determination of pH of different types of soil samples
2. Determination of electrical conductivity of different types of soil samples.
3. Determination of total alkalinity of soil.
4. Determination of total organic matter in the given soil Sample.
5. Determination of available nitrogen of the soil sample
6. Determination of total Phosphorous of the soil sample
7. Determination of Ca (II)ions from 02 different soil samples.
8. Determination of Fe (II) and Fe (III) ions from soil sample.
9. Determination of K from soil sample by flame photometry
10. Determination of Na from soil sample by flame photometry
11. Determination of available sulphur in soils

Examination

Selection of experiments may be done by the students based on the picking up of chits. Viva questions may be asked on any of the experiments prescribed in the practical syllabus.

Distribution of marks

1. **Preparation experiment:** Reaction – 03 marks, Calculation of theoretical Yield- 02 mark, Observed yield-12 marks, Journal- 03 marks, Viva- voce – 05 marks, **Total= 25 marks**
2. For analysis experiments, identification of adulterants in each sample carries 4 marks. (Four different samples may be given, one mark for systematic presentation)

   Deduction of Marks for accuracy:

   Less than 10% yield- 5 marks, 11-15%- 4 marks, 16-20%-3 marks, 21-25%- 2 marks, above 25%- zero marks
3. **Determination experiments:**
   Accuracy-10 marks, Technique and Presentation-2, Calculation and graph-5 marks, Journal-3 marks, Viva-Voce-5 marks, Total=25 marks.
   Deduction of Marks for accuracy:
   Error up to 5% - 10 marks, 6 - 10% 08 marks, 11-15% 06 marks, 16-20% 04 marks, above 20% zero (0) marks
4. **Chromatographic Techniques**
   Distribution of Marks:
   Journal – 03 marks, Viva-Voce-5 marks
   For main experiment: 17 marks

a. Preparation of paper / Column for Chromatography: 8 marks
b. Spotting of TLC: 03 marks
c. Identification of Spots: 03 Marks
d. R_f Calculation: 03 marks

Marks for Accuracy: Error up to 10% -17 marks, 11-15%- 14 marks, 16-20%- 10 marks, 21-25% - 07 marks, 26 – 30 % - 05 marks and above 30% nil.