

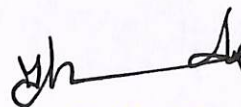
St. FRANCIS COLLEGE FOR WOMEN, BEGUMPET HYDERABAD-500016
(An Autonomous College Affiliated to Osmania University)
DEPARTMENT OF CHEMISTRY

DISCIPLINE SPECIFIC CORE II CHEMISTRY II B.Sc. I - SEMESTER- II 60 h
Module 1: Inorganic Chemistry Chemistry of d-Block elements Chemistry of f-Block elements
Module 2: Organic Chemistry Halogen Compounds Hydroxy Compounds and Ethers Carbonyl Compounds
Module 3: Physical Chemistry Electrochemistry
Module 4: General Chemistry Chemical Bonding Stereoisomerism Colligative Properties

B. Saritha

Head

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Professor

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**SEMESTER - II
CHEMISTRY - II****1. Course Description**

Programme: B.Sc.
Course Code: U26/CHE/DSC/201
Course type: DSC - 2
No. of credits: 4

Max. Hours: 60
Max. Marks: 100
Hours per week: 4

2. Course Objectives

- To enable students to critically understand the electronic structure, periodic trends, magnetic and spectral properties, complex formation, and applications of d- and f-block elements.
- To develop a clear understanding of the structure, reactivity, preparation methods, and reaction mechanisms of halogen compounds, alcohols, ethers, and carbonyl compounds.
- To provide a comprehensive understanding of electrochemical principles, including electrode potentials, electrochemical cells, and their practical applications.
- To impart fundamental knowledge of chemical bonding theories, stereochemical concepts, and colligative properties to explain the structure and behavior of chemical substances.

3. Course Outcomes

On completion of the course the student will be able to

- Explain and predict the chemical behavior of d- and f-block elements based on electronic structure and bonding principles.
- Analyze reactions and predict products of halogen, alcohol, ether, and carbonyl compounds.
- Calculate electrode potentials, analyze electrochemical cells, and apply electrochemical concepts to practical systems such as batteries and corrosion.
- Students will be able to apply bonding theories, distinguish stereoisomers, and solve numerical problems related to colligative properties.

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4. Course Content

MODULE I: INORGANIC CHEMISTRY

15 h (1h/week)

Chemistry of d-block elements

7h

Characteristics of d-block elements with special reference to electronic configuration, variable oxidation states, color properties, d-d spectral transitions, ability to form complexes, magnetic properties, calculation of magnetic moment-spin only formula & catalytic properties. Comparative treatment of second and third transition series with their 3d analogues.

Chemistry of f-block elements

8h

Chemistry of Lanthanides: Position in periodic table, electronic structure, oxidation state, ionic and atomic radii/ionic radii- lanthanide contraction- cause and consequences, anomalous behavior of post lanthanides-complexation-type of donor ligands preferred. Magnetic properties- paramagnetism, color and spectra, f-f transitions-occurrence and separation-ion exchange method, solvent extraction.

Chemistry of actinides: General features-electronic configuration, oxidation state, actinide contraction, color and complex formation. Comparison with lanthanides.

IKS: Case studies on The Iron Pillar of Delhi – Metallurgical Excellence and Monazite Sands of Kerala – Source of Rare Earths and Thorium.

MODULE II: ORGANIC CHEMISTRY

15 h (1h/week)

Halogen compounds

4 h

Classification: alkyl (primary, secondary, tertiary), aryl, aralkyl,. Chemical reactivity - reduction, formation of RMgX, Nucleophilic substitution reactions – classification into S_N1 and S_N2 . Mechanism and energy profile diagrams of S_N1 and S_N2 reactions. Stereochemistry of S_N2 (Walden Inversion) 2-bromobutane, S_N1 (Racemization) 1-bromo-1-phenylpropane.

Hydroxy compounds and ethers

5 h

Alcohols: Preparation: 1°, 2° and 3° alcohols using Grignard reagent, Reduction of Carbonyl compounds, carboxylic acids and esters. Physical properties: H-bonding, Boiling point and Solubility. Reactions with Sodium, HX/ZnCl₂ (Lucas reagent), oxidation with conc. HNO₃ and Oppenauer oxidation (Mechanism).

Phenols: Preparation: (i) from diazonium salts of anilines and (ii) from benzene sulphonic acids. Properties: Acidic nature, formation of phenoxide and reaction with R-X, electrophilic substitution; halogenations, Reimer Tiemann reaction (Mechanism), Gattermann-Koch reaction, Schotten Baumann reaction.

Ethers: Nomenclature, preparation by Williamson synthesis. Chemical properties – inert nature, action of conc. H₂SO₄.



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Carbonyl compounds

6h

Preparation of aldehydes & ketones from acid chlorides, nitriles and carboxylic acids. Special methods of preparing aromatic aldehydes and ketones by Oxidation of arenes. Physical properties – absence of Hydrogen bonding. Reactivity of the carbonyl groups in aldehydes and ketones. Chemical reactivity: Addition of (a) NaHSO₃ (b) HCN (c) RMgX (d) 2,4-DNP (Schiff base). Addition of H₂O to form hydrate, addition of alcohols - hemiacetal and acetal formation. Cannizzaro reaction. Oxidation reactions – KMnO₄ oxidation, reduction – catalytic hydrogenation, mechanism of Clemmensen reduction, Meerwein-Ponndorf-Verley reduction.

MODULE III: PHYSICAL CHEMISTRY

15 h (1h/week)

Electrochemistry

15h

Revision of conductance, specific conductance, equivalent conductance and factors influencing conductance of electrolytes. Ionic mobility, definition and significance of transport number. Kohlrausch's law – its applications: determination of degree of dissociation and acid dissociation constant (K_a) of weak acids, solubility product determination and conductometric titrations. Ostwald's dilution law - its uses and limitations. Debye- Hückel -Onsager's equation for strong electrolytes (elementary treatment only).

Types of electrodes with examples - Types of reversible electrodes - the gas electrode, metal metal ion, metal-insoluble salt, redox electrodes and ion-selective electrode. Reversible and irreversible cells; Nernst equation – EMF of a cell; representation of a cell-problems; electrode potentials-electrochemical series and its significance. Determination of pH – using quinhydrone and glass electrodes. Potentiometric titrations.

MODULE IV: GENERAL CHEMISTRY

15 h (1h/week)

Chemical Bonding

5h

Molecular orbital theory: Shapes and sign convention of atomic orbitals. Modes of bonds. Criteria for orbital overlap. LCAO concept. π and σ overlapping. Concept of Types of molecular orbitals: bonding, antibonding and non-bonding. MOED of homonuclear diatomic molecules - H₂, N₂, O₂, O₂⁻, O₂²⁻, F₂ (unhybridized diagrams only) and heteronuclear diatomics - CO, CN⁻, NO, NO⁺ and HF, their bond order, stability and magnetic properties.

Stereoisomerism

5h

Optical activity: Definition, wave nature of light, plane polarized light, optical rotation and specific rotation, chiral centers. Chiral molecules: definition and criteria - absence of plane, center and S_n axis of symmetry – asymmetric and dissymmetric molecules. Examples of asymmetric molecules (Glyceraldehyde, Lactic acid, Alanine) and dissymmetric molecules (trans- 1,2-Dichlorocyclopropane). Molecules with constitutionally symmetrical chiral carbons (Tartaric acid) Molecules with constitutionally unsymmetrical chiral carbons (2,3-Dibromopentane). D, L configuration – examples. R, S – configuration: Cahn-Ingold-Prelog (CIP) rules.

Colligative Properties

5h

Definition of colligative properties- relative lowering of vapour pressure-Raoult's law; Osmotic pressure; elevation of boiling point and depression of freezing point; thermodynamic relation between molecular weight and colligative property (derivations not required) -Problems.

5. Reference Books

General reference: B.Sc. I Year Chemistry : Semester II, Telugu Academy publication, Hyd.

Module- I

1. Puri, B. R., Sharma, L. R., & Kalia, M. S. (1996). Principles of inorganic chemistry. Vishal Publications.
2. Lee, J. D. (1981). Concise inorganic chemistry (3rd ed.). Oxford University Press.
3. Cotton, F. A., Wilkinson, G., & Gaus, P. L. (2001). Basic inorganic chemistry (3rd ed.). Wiley.
4. Greenwood, N. N., & Earnshaw, A. (1989). Chemistry of the elements. Pergamon Press.
5. Shriver, D. F., & Atkins, P. W. (1999). Inorganic chemistry (3rd ed.). Oxford University Press.
6. Huheey, J. E., Keiter, E. A., & Keiter, R. L. (1993). Inorganic chemistry: Principles of structure and reactivity (4th ed.). Harper Collins College Publishers.
7. Gopalan, R. (2009). Textbook of inorganic chemistry. University's Press.

Module- II

1. Morrison, R. T., & Boyd, R. N. (2011). Organic chemistry. Pearson Education (Prentice Hall).
2. Solomons, T. W. G., & Fryhle, C. B. (2016). Organic chemistry. Wiley (John Wiley & Sons).
3. Bruice, P. Y. (2017). Organic chemistry. Pearson Education.
4. Wade, L. G., Jr. (2013). Organic chemistry. Pearson Education.
5. Jones, M., Jr. (2010). Organic chemistry. W. W. Norton & Company.
6. McMurry, J. (2015). Organic chemistry. Cengage Learning (Brooks/Cole).
7. Soni, P. L., & Soni, H. M. (2012). Organic chemistry. Sultan Chand & Sons.
8. Ghosh, S. K. (2009). General organic chemistry. Bharati Bhawan Publishers.
9. Pillai, C. N. (2008). Organic chemistry. Universities Press (India) Pvt. Ltd.

Module-III

1. Glasstone, S., & Lewis, D. (1966). Elements of physical chemistry. Macmillan.
2. Maron, S. H., & Lando, J. B. (1966). Fundamentals of physical chemistry. Macmillan Limited.
3. Puri, B. R., Sharma, L. R., & Pathania, M. S. (2013). Principles of physical chemistry (46th ed.). Vishal Publishing Company.
4. Atkins, P. W. (2001). Physical chemistry (7th ed.). Oxford University Press.

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b. Components on Skill Development/Entrepreneurship Development/Employability

SD/ED /EMP	Syllabus Content	Description of Activity
SD	Module I	Encourage them to compare and discuss trends in reactivity and chemical behaviour.
EMP	Module II	Design and present a synthetic pathway for an industry-relevant product using halogen, hydroxy, ether, and carbonyl compounds, including mechanism and yield.
ED (NSQF level 3 or 4)	Module III	Enables students to identify opportunities and develop innovative, cost-effective solutions in energy storage, corrosion control, electroplating, and other electrochemical industries.
EMP	Module IV	Solve and present a set of application-based problems on chemical bonding, stereochemistry, and colligative properties, explaining reasoning and calculations.

c. IKS component:

IKS	Syllabus Content	Module
	Introduced Case studies on The Iron Pillar of Delhi – Metallurgical Excellence and Monazite Sands of Kerala – Source of Rare Earths and Thorium.	I

7. Pedagogy

S. No.	Student Centric Methods Adopted	Type / Description of Activity
1	Experiential learning	Field trips
2	Participative Learning	Presentations/Peer-teaching
3	Problem solving	Case studies/ Data interpretation

8. Course Assessment Plan

a) Weightage of Marks in Continuous Internal Assessments and End Semester Examination

CO	Continuous Internal Assessments CIA - 40%	End Semester Examination-60%
CO1	CIA-1: Written Exam	Written Exam
CO2	CIA-2: Quiz/Assignment/3D model making	
CO3	CIA-1: Written Exam	
CO4	CIA-2: Assignment (Crossword/Word search/ Problem solving)	

b) Model Question Paper - End Semester exam Theory

St. FRANCIS COLLEGE FOR WOMEN, BEGUMPET, HYDERABAD-500016
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Faculty of Science – Department of Chemistry

MODEL PAPER

B.Sc. I YEAR SEMESTER -II

CHEMISTRY - II

Time: 2 hrs

Course Code: U26/DSC/CHE/201

Max. Marks: 60

SECTION –A (Essay Questions)

I. Answer the following

4x 10=40 Marks

- What are Transition elements? Explain the general properties with reference to Complex formation, magnetic properties and variable oxidation states. 10M
OR
- What is lanthanide contraction and explain its consequences. 5M
 - How are lanthanides separated by ion exchange method? 5M
- Explain the mechanism and stereochemistry of S_N1 reaction. 5M
 - How are 1° , 2° and 3° alcohols prepared from carbonyl compounds using Grignard reagent? 5M
- OR
- Formulate the steps involved in the mechanism of (i) Reimer -Teimann reaction and (ii) Cannizzaro reaction. 10M
- Explain standard hydrogen electrode (SHE). 5M
 - State Ostwald's dilution law. Discuss its uses and limitations. 5M

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OR

6. a. State Kohlrausch law and mention its applications. 5M
 b. Describe Hittorf method for the determination of Transport number. 5M
7. Write the postulates of MOT and explain the MOED of O₂. 10M

OR

8. a. State and explain Raoult's law. 5M
 b. What are enantiomers? Explain the optical isomers of Tartaric acid. 5M

SECTION –B (Short Answer Questions)**II. Answer any four.****4x5=20 Marks**

9. Compare the properties of lanthanides with actinides.
10. How do you differentiate 1°, 2° and 3° alcohols based on the Lucas test?
11. Give equations for Williamson's ether synthesis and Clemmensen's reduction..
12. Write short notes on conductometric titrations.
13. What is an electrochemical series? What is its significance?
14. Discuss the R,S configuration of L-Alanine and D-Glyceraldehyde based on CIP rules.

Question Paper Format - Blooms Taxonomy Level

SECTION A - INTERNAL CHOICE				4 X 10 = 40 M	
Question Number	Module	Question	CO	BTL	
1	I	What are Transition elements? Explain the general properties with reference to Complex formation, magnetic properties and variable oxidation states. 10M OR	CO1	Level 1 & 2	
2	I	a. What is lanthanide contraction and explain its consequences. 5M b. How are lanthanides separated by ion exchange method? 5M	CO1	Level 1 & 3	
3	II	a. Explain the mechanism and stereochemistry of S _N 1 reaction. 5M b. How are 1°, 2° and 3° alcohols prepared from carbonyl compounds using Grignard reagent? 5M OR	CO2	Level 3	

4	II	Formulate the steps involved in the mechanism of (i) Reimer -Teimann reaction and (ii) Cannizaro reaction. 10M	CO2	Level 4
5	III	a. Explain standard hydrogen electrode (SHE). 5M b. State Ostwald's dilution law. Discuss its uses and limitations. 5M OR	CO3	Level 2
6	III	a. State Kohlrausch law and mention its applications. 5M b. Describe Hittorf method for the determination of Transport number. 5M	CO3	Level 2 & 3
7	IV	Write the postulates of MOT and explain the MOED of O ₂ . 10M OR	CO4	Level 2 & 3
8	IV	a. State and explain Raoult's law. 5M b. What are enantiomers? Explain the optical isomers of Tartaric acid. 5M	CO4	Level 2 & 3
SECTION B - Short answer questions				
ANSWER ANY 4 OUT OF 6			4 x 5 = 20M	
9	I	Compare the properties of lanthanides with actinides.	CO1	Level 4
10	II	How do you differentiate 1°, 2° and 3° alcohols based on the Lucas test?	CO2	Level 4
11	II	Give equations for Williamson's ether synthesis and Clemmensen's reduction..	CO2	Level 2
12	III	Write short notes on conductometric titrations.	CO3	Level 2
13	III	What is an electrochemical series? What is its significance?	CO3	Level 2
14	IV	Discuss the R,S configuration of L-Alanine and D-Glyceraldehyde based on CIP rules.	CO4	Level 5

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c) Question Paper Blueprint

Modules	Hours Allotted in the Syllabus	COs Addressed	Section A (No. of Questions)	Total Marks	Section B (No. of Questions)	Total Marks
1	15	CO1	2	10	6 (By taking at least one question from each module)	5
2	15	CO2	2	10		10
3	15	CO3	2	10		10
4	15	CO4	2	10		5

9. CO-PO Mapping

CO	PO	Cognitive Level	Classroom sessions (h)
1	1,3	Understand	15
2	1,2	Analyse	15
3	1,2	Apply	15
4	1,7	Remember	15

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(An Autonomous College Affiliated To Osmania University)
FACULTY OF SCIENCE- DEPARTMENT OF CHEMISTRY
SEMESTER -II
LABORATORY COURSE-II - QUALITATIVE ANALYSIS

1. Course Description**Program: B.Sc.****Course Code: U26/CHE/DSC/201/ P****Course type: DSC-2****No. of Credits: 1****Max. Hours: 20****Max. Marks: 50****Hours per week: 2****2. Course Objective**

- To enable students to systematically identify and analyze anions and cations in salt mixtures using semi-micro qualitative analysis techniques.

3. Course outcomes

CO 1: Students will be able to systematically identify anions and cations in salt mixtures, interpret experimental observations, and write balanced equations for the reactions involved.

CO 2: Students will be able to apply the principles of common ion effect and solubility product to explain and justify the systematic separation and identification of both anions and cations in semi-micro qualitative analysis.

4. Course Content**QUALITATIVE ANALYSIS - Semi micro analysis of mixtures**

Analysis of two anions (one simple, one interfering) and two cations in the given mixture.

Anions: CO_3^{2-} , SO_3^{2-} , S^{2-} , Cl^- , Br^- , I^- , CH_3COO^- , NO_3^- , PO_4^{3-} , BO_3^{3-} , SO_4^{2-}

Cations: Hg_2^{2+} , Ag^+ , Pb^{2+}

Hg^{2+} , Bi^{3+} , Cd^{2+} , Cu^{2+} , As^{3+} / As^{5+} , Sb^{3+} / Sb^{5+} , Sn^{2+} / Sn^{4+}

Al^{3+} , Cr^{3+} , Fe^{3+}

Mn^{2+} , Co^{2+} , Ni^{2+} , Zn^{2+}

Ca^{2+} , Ba^{2+} , Sr^{2+}

Mg^{2+} , NH_4^+

Reference Books

- Svehla, G. (1996). Vogel's qualitative inorganic analysis (7th ed.). Prentice Hall.
- Gopalan, R., Subramanian, P. S., & Raghavan, K. (2004). Elements of analytical chemistry. Sultan Chand & Sons.
- Ahluwalia, V. K., and Sunita Dhingra, (2005). A Laboratory Manual of Organic and Inorganic Chemistry, 1st Edition, University Press, Hyderabad, ISBN: 9788173715623

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- Giri, A. N. (2010). A textbook of practical chemistry. Himalaya Publishing House.
- Sharma, R. K. (2013). Experiments and techniques in inorganic chemistry. Krishna Prakashan Media.
- O.P. Pandey, D.N. Bajpai, & S. Giri. (2020). Practical chemistry. 10th Revised Edition, S. Chand Publishing. ISBN: 9789352535859.
- Gopalan, R., Venkappayya, D., and Nagarajan, S. (2012). Textbook of Inorganic Chemistry (Lab Manual), 3rd Edition, University's Press, Hyderabad, ISBN: 9788173718204
- Vogel, A. I. and Svehla, G. Vogel's Textbook of Macro and Semi-Micro Qualitative Inorganic Analysis, 5th Edition, Longman Group Ltd., 1979. ISBN: 9780582446939

6. Model Question Paper - End Semester Exam Practical

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Faculty of Science – Department of Chemistry

MODEL PAPER

B.Sc. I YEAR SEMESTER -II

LABORATORY COURSE-II - QUALITATIVE ANALYSIS

Program: B.Sc.

Type of course: DSC-2

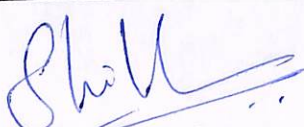


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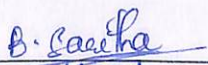
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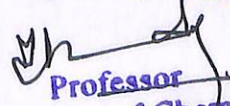
Time: 2 hrs

Max. Marks: 50

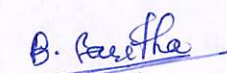
- Using systematic procedure, identify and report two anions and two cations present in the given an unknown salt mixture. 30M
- Record + Attendance 10M
- Viva voce 10 M


Prepared by	Checked & Verified by	Approved by
 Dr Shikha Chander Ms V Prashanthi	 Dr Saritha Aduri HoD	 Prof. Uma Joseph Principal <i>Principal</i> St. Francis College for Women Begumpet, Hyderabad-16.


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PANEL OF EXAMINERS							
FACULTY OF SCIENCES - DEPARTMENT OF CHEMISTRY							
CBCS-2026							
S · N o	Course Title	Examiner	Name & Designation	Place of Work	Yrs of Exp er i e n c e	Contact No.	Email Id.
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		Dr. S. Sreekanth	Dr. S. Sreekanth Assistant Professor of Organic Chemistry	Dept of Chemistry Veeranari Chakali Ilamma Women's University	22	8465945408	Sivan.sreekanth@gmail.com
		Dr. Radhika. M	Dr. Radhika. M Assistant Prof. of Inorganic Chemistry	Head, Dept of Chemistry, Nizam college,Hyderabad	20	9032841181	radhikamone@yahoo.com
2	Semester II	Dr. Mary Nygi. K	Dr. Mary Nygi. K Assistant Professor of Organic Chemistry	Head,Dept of Chemistry Bhavan's Vivekananda Degree and PG College	20	9963123387	knygi@yahoo.com
		Ms. M. Sujatha	Ms. M. Sujatha Assistant Professor of Organic Chemistry	Dept of Chemistry St. Ann's college for women	15	9866049923	sujatha.stanns09@gmail.com
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SEMESTER II
Core Course 2
CHEMISTRY OF NUCLEIC ACIDS &
BIOCHEMICAL TECHNIQUES

Code : U26/BIC/DSC/201

Credits : 4

Total hours : 60

Hours/week : 4

Module I : COMPOSITION OF NUCLEIC ACIDS

Module II : STRUCTURE OF NUCLEIC ACIDS

**Module III : SPECTROPHOTOMETRIC & CENTRIFUGATION
TECHNIQUES**

**Module IV : CHROMATOGRAPHY & ELECTROPHORETIC
TECHNIQUES**

Semester -II

CHEMISTRY OF NUCLEIC ACIDS & BIOCHEMICAL TECHNIQUES

1. Course Description

Programme	: B.Sc.	Max. Hours:	60
Course Code	: U26/BIC/DSC/201	Hours per week:	4
Type of course	: DSC 2	Max. Marks:	100
No. of credits	: 4		

2. Course Objectives

1. To understand the structure, composition, and organization of nucleic acids, including DNA and RNA, and their components such as nucleotides and phosphodiester linkages.
2. To learn various important techniques of separation like chromatography, electrophoresis, centrifugation, and spectroscopy.

3. Course Outcomes


After the successful completion of the course, the student will be able to:

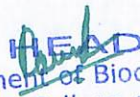
CO1: Describe the organization, composition, and chemical structure of nucleic acids (L2)

CO2: Explain the structure of DNA based on the Watson–Crick model and describe DNA denaturation, reassociation kinetics, and the types and functions of RNA. (L2)

CO3: Illustrate the separation techniques like colorimetry, spectrophotometry and centrifugation. (L3)

CO4: Analyze the principle and applications of Chromatography and electrophoresis(L4).


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4. Course Content**Module I: COMPOSITION OF NUCLEIC ACIDS****15 Hours**

Organization of DNA in the cell, including its arrangement in mitochondria and chloroplasts; the composition of nucleic acids such as DNA and RNA; the structure of purines and pyrimidines; nucleosides and nucleotides; the formation and stability of phosphodiester linkages; the effects of acids, alkalis, nucleases, and phosphodiester linkages on nucleic acids; and the photochemical and spectral characteristics of nucleic acids.

Module II: STRUCTURE OF NUCLEIC ACIDS**15 Hours**

Watson and Crick model of the DNA double helix; an introduction to circular DNA, supercoiling, and the helix-to-random coil transition; denaturation of nucleic acids and the hyperchromic effect; melting temperature (T_m) values and their significance; reassociation kinetics including Cot curves and their significance; and the different types of RNA, micro RNA along with their biological functions.

Module III: SPECTROPHOTOMETRIC & CENTRIFUGATION TECHNIQUES**15 Hours**

Concept of absorbance and the electromagnetic spectrum, Beer–Lambert’s law along with its limitations, and the principles of colorimetry and spectrophotometry. It also covers UV and visible spectra, the molar extinction coefficient, the principle and applications of fluorimetry, the principle of centrifugation and sedimentation coefficient, and the different types of centrifugations along with their applications.

Module IV: CHROMATOGRAPHY & ELECTROPHORETIC TECHNIQUES**15 Hours**

Introduction to chromatography and the principles of chromatographic techniques, including including paper chromatography and its applications, thin layer chromatography and its applications, gel filtration (molecular sieve) chromatography, ion exchange chromatography, and affinity chromatography. It also includes electrophoresis, with emphasis on its principle and applications, including native electrophoresis, SDS-PAGE, and agarose gel electrophoresis.

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5. Reference Books


1. Lehninger: Principles of Biochemistry (2013) 6thed., Nelson, D.L. and Cox, M.M.W.H. Freeman and Company (New York).
2. Trevor Palmer: Enzymes (Biochemistry, Biotechnology, Clinical Chemistry), (2001) Horwood Publishing, ISBN 1-898563-78-0.
3. Wilson & Walker : Principles & Biochemical Techniques of Practical Biochemistry,(2000) Cambridge University Press. (Fifth Edition)
4. Upadhyaya & Upadhyaya. Biophysical Chemistry (2009) Himalayan Publishers.
5. Mathews: Biochemistry –3rd edition. Pearson Education Limited. (2003). ISBN: 81-297-0215-0.

6. Syllabus Focus

- a) Relevance to Local, Regional, National and Global Development Needs

Local /Regional/National /Global Development Needs	Relevance
Global Development needs	Analytical techniques play a crucial role in various fields and industries, providing valuable insights and information


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b) Components on Skill Development/Entrepreneurship Development/Employability

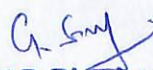
SD/ED/EMP	Syllabus Content	Description of Activity
SD/EMP	Chromatography	Practicals
SD/EMP	Centrifugation	Practicals
SD/EMP	Electrophoresis	Practicals


7. Pedagogy

S. No	Student Centric Methods Adopted	Type / Description of Activity
1.	Science experiments	Experiential Learning
2.	Field trip	Experiential Learning
3.	Presentations/Assignments	Participative Learning

8. Course Assessment Plana) **Weightage of Marks in Continuous Internal Assessments and End Semester Examination**

COs	Continuous Internal Assessments – CIA (40%)	End Semester Examination (60%)
CO1	CIA-1	End Semester examination
CO2	CIA-1	
CO3	CIA-2 – Objective	
CO4	CIA-2 - Assignment/ model making/ PPT	


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b) **Model Question Paper-End semester exam Theory**

CHEMISTRY OF NUCLEIC ACIDS & BIOCHEMICAL TECHNIQUES

Course Code: U26/BIC/DSC/201
Credits: 4

Max Time: 2 Hrs
Max. Marks: 60

I. Answer the following questions

(4x10=40M)

1. Explain the composition of Nucleic acids in DNA

OR

2. Describe the effects of acids, alkalies, nucleases and phospho diester linkages on nucleic acids

3. Illustrate Watson and Crick model of DNA double Helix.

OR

4. Explain denaturation of Nucleic acids and define the hyperchromic effect, melting temperature values.

5. Distinguish Colorimetry & Spectrophotometry

OR

6. Explain the Principle and applications of Fluorimetry

7. Demonstrate the principle & applications of Ion exchange chromatography.

OR

8. Define Electrophoresis and describe the agarose gel electrophoresis with principle and applications.

II. Write Short notes on any 4 questions

(4x5=20M)

9. Structure of Purines & Pyrimidines

10. Types of RNA


11. Principle of paper chromatography

12. Sedimentation Coefficient

13. Molar extinction coefficient

14. SDS PAGE


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Question Paper format – Blooms Taxonomy Level

SECTION A - INTERNAL CHOICE				4Q X 10 M = 40 M
Question Number	Module Covered	Question	CO	BTL (Blooms Taxonomy Level)
1	Module 1	Explain the composition of Nucleic acids in DNA	CO 1	Level II
2	Module 1	Describe the effects of acids, alkalies, nucleases and phosphodiester linkages on nucleic acids	CO 1	Level II
3	Module 2	Illustrate Watson and Crick model of DNA double Helix	CO 2	Level II
4	Module 2	Explain denaturation of Nucleic acids and define the hyperchromic effect, melting temperature values.	CO 2	Level II
5	Module 3	Distinguish Colorimetry & Spectrophotometry	CO 3	Level III
6	Module 3	Explain the Principle and applications of Fluorimetry	CO 3	Level III
7	Module 4	Demonstrate the principle & applications of Ion exchange chromatography.	CO 4	Level IV
8	Module 4	Define Electrophoresis and describe the agarose gel electrophoresis with principle and applications	CO 4	Level IV
SECTION B - ANSWER ANY 4 OUT OF 6 (To compulsorily have ONE question from each module)				4Q X 5 M = 20 M
9	Module 1	Structure of Purines & Pyrimidines	CO 1	Level II
10	Module 2	Types of RNA	CO 2	Level II
11	Module 3	Molar extinction coefficient	CO 3	Level III
12	Module 3	Sedimentation Coefficient	CO 3	Level III
13	Module 4	Principle of paper chromatography	CO 4	Level IV
14	Module 4	SDS PAGE	CO 4	Level IV

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c) Question Paper Blueprint

Modules	Hours Allotted in the Syllabus	COs Addressed	Section A (No. of Questions)	Total Marks	Section B (No. of Questions)	Total Marks
1	15	CO-1	2	4X10=40M	6 (Open Choice) Atleast 1 Question from each Module	4X5=20M
2	15	CO-2	2			
3	15	CO-3	2			
4	15	CO-4	2			

9. CO-PO Mapping:

CO	PO	Cognitive Level	Class room sessions(hrs)
1	1	Understand/ Remember	15
2	2	Application	15
3	2	Application	15
4	1,2	Analysing	15

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ESTIMATION OF NUCLEIC ACIDS & BIOCHEMICAL TECHNIQUES

PRACTICAL

1. Course Description:

Max. Hours: 30
Course Code: U26/BIC/DSC/201/P
Type of course: DSC

Hours per week: 2
No. of credits: 1
Max. Marks: 50

2. Course objective:

- Acquire skills of important separation techniques.

3. Course Outcomes:

CO1: Demonstrate their skills in qualitative identification of amino acids.
CO2: Apply the knowledge of separation techniques of biomolecules.


4. Course Content

PRACTICAL SESSIONS

1. Qualitative analysis of Amino acids (4 sessions)
2. Verification of Beer Lamberts law
3. Absorption Maxima
4. Estimation of DNA
5. Estimation of RNA
6. Separation of Amino Acids by Paper Chromatography
7. Separation of Lipids by TLC
8. Gel Filtration Chromatography
9. Paper Electrophoresis

5. Reference Books

1. Experimental Biochemistry-A student companion -Beedu Sashidhar Rao & Vijay Deshpande
2. Laboratory Manual in Biochemistry-Jayaraman, J. Wiley Eastern


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Model Question Paper – End Semester Exam Practical


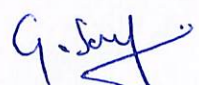
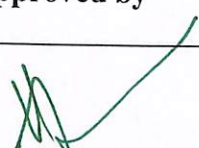
CHEMISTRY OF NUCLEIC ACIDS & BIOCHEMICAL TECHNIQUES

Course Code: U26/BIC/DSC/201/P
Credits: 1


Max Time: 2 Hrs
Max. Marks: 50


Answer the following: -

1. Write the schematic representation (flowchart) for the qualitative analysis of
 - a. Amino acids
 - b. Principle involved in Gel filtration chromatography (10 M)
2. Identify the given amino acid present in the given solutions **A** and **B** (10 + 10 M)
3. Perform Paper chromatography of amino acids & calculate the R_f value of the mixture. (10 M)
4. Viva (5M)
5. Record (5M)

Prepared by	Checked & verified	Approved by
 Dr. S. Parijatham Kanchana Teaching faculty	 Dr. G. Sony HoD HOD Biochemistry	 Prof. Uma Joseph Principal

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Panel of Examiners

Semester/ Course Title	Examiner	Designation Place of Work	Years of Experience	Contact No.	Email Id.
Semester I Molecules of Life	Ms. S.Vanitha	Assistant Professor, Bhavan's Vivekananda college, Sainikpuri.	19	9985549428	vanitha.biochem@bhavansvc.ac.in
	Dr.S.Ravi kiran	Assistant Professor, RBVRR College- Naryanguda, Hyderabad	20	9948043292	srksuripeddi@gmail.com
Semester II Chemistry of Nucleic acids & Biochemic al techniques	Ms. Shailaja	Assistant Professor, St. Ann's College for Women, Mehdipatnam Hyderabad	18	9849174742	sylaja.mekala@gmail.com
	Ms. C. Vanisree	HOD, St. Pious College, Nacharam, Hyderabad.	18	9703599392	vanisree.ch@stpiouscollege.org



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SEMESTER - II

PROGRAMMING IN C

1. Course Description

Programme: B.Sc.

Course Code: U26/CAP/DSC/201

Course Type: DSC

No. of credits: 4

Max. Hours: 60

Hours per week:4

Max. Marks: 100

2. Course Objectives

1. To understand the art of writing programs using C
2. To apply all the concepts learnt in C programming in developing programs and applications in C.
3. To practice writing codes efficiently.

3. Course Outcomes

After the successful completion of the course, the student will be able to:

CO1: *Explain* basic concepts of C programming and program structure. (L II)

CO2: *Apply* control structures and arrays to develop C programs. (L III)

CO3: *Analyze* programs using functions, strings, structures, and unions (L IV)

CO4: *Implement* pointer-based programs with dynamic memory and file I/O. (L III)

4. Course Content

MODULE I:


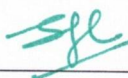
15 Hours

Programming Fundamentals

Introduction to Computer Software, classification of computer Software, Programming Languages, Algorithms and Flow charts.

Basics of C Programming

Introduction, Characteristics of C, uses of C, Structure of a C, writing, compiling and Executing C Program. Preprocessor Directives Processes involved in program execution: compilation, interpretation, loading and linking. Comments, Keywords, Identifiers, Basic



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data types, variables, constants, Input /Output Statements, operators in C, type Conversion and type casting.

MODULE II: 15 Hours

Control Structures and Arrays

Control Statements: Introduction, Conditional Branching Statement: if, if-Else, if-Else-if Statement, Switch Case. Iterative statements: while, do-while and For, Nested loops, Arrays: Introduction, Declaration, Initialization, Accessing elements, storing values on One-dimensional arrays and two-dimensional arrays.

MODULE III 15 Hours

Functions

Functions: Introduction, Declaration, Definition, Function call, return statement, passing Parameters to the function, and calling mechanisms, types of functions, String: string functions, call-by-value, call-by-reference. Passing arrays to functions, Scope of variables, Storage classes. recursive Function.

Strings, Structures, Unions

Strings: Introduction, String Operations. Structures and Unions: Introduction-Declaration, initialization, Accessing the members, Structures vs. Unions. Enumerated data types.


MODULE IV: 15 Hours

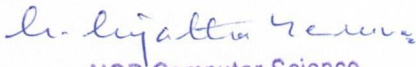
Pointers and Files

Pointers: Introduction, Declaring Pointer variables, Pointer Expressions and Pointer, Arithmetic, Null Pointers, Dynamic Memory Allocation, Drawback of Pointers. Files: Introduction, Reading Data from files, Writing data to files. Working with text and binary files.

5. References Books

1. "Programming in C", by Reema Thareja, Oxford University Press, Second Edition, 2016
2. Programming with C, by Byron S. Gottfried, Schaum's Outline Series ,2E
3. Let Us C, by Yashwant Kanetkar, BPS Publications, 13E,
4. Programming in ANSI C, by Balaguruswamy, McGraw Hill Education, 7E
5. C Programming Language, by Brian W. Keringhan, Dennis M Ritchie, Pearson Publications, 2E
6. A Structured Programming Approach Using C by B. A. Forouzan.


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6. Syllabus Focus

a) Relevance to Local, Regional, National and Global Development Needs

S. No	Local/Regional/National /Global Development Needs	Relevance
1.	National	C is an adaptable, effective, and performance-driven language.
2.	Global	C is language and is widely employed in everything from system software to game development.

b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
Skill Development	Modules II, III & IV	Designing algorithms, flowcharts and writing C programs for given algorithm and testing programming skills in C.

7. Pedagogy

S. No	Student Centric Methods Adopted	Type / Description of Activity
1.	Participative Learning	Seminars, Presentations and Group discussions.
2..	Problem solving	Case Studies

8. Course Assessment Plan

a) Weightage of Marks in Continuous Internal Assessments and End Semester Examination

CO	Continuous Internal Assessments CIA -40%	End Semester Examination-60%
CO1	CIA 2– Test 1: MCQ's, Quiz test or subjective	Written Exam
CO2	CIA 2 – Subjective	
CO3		
CO4	CIA 2 – Test 2: MCQ's or Presentation	

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b) Model Question Paper- End Semester Exam Theory

PROGRAMMING IN C

Course Code: U26/CAP/DSC/201

Credits: 4

MAX MARKS: 60

TIME: 2 hours

Note: This question paper consists of Section A and B. The answer to Section A & B must be written in the answer book given.

Section - A (Long Essay Type)

Answer ALL questions:

Marks:4 x 10 = 40

1. What are the different symbols used in flow charts? Design a flow chart to find the maximum of three numbers
OR
2. What are different data types supported in C with examples.
3. What are arrays? Explain one-dimensional array with an appropriate program
OR
4. Explain the concept of if-else and nested if. Write a program to show the usage of both if else and nested if.
5. Elaborate the need for recursion. Write a program to print factorial of a number using recursion.
OR
6. Explain the difference between structure and union with an example
7. Explain the concept of Pointers with a suitable example.
OR
8. Explain various file operations and their functions in C.

Section – B (Short Essay Type)

II. Answer any Four:


4 x 5 = 20M

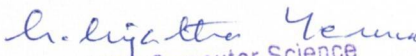
9. Explain switch case with example.
10. Define Algorithms and write an algorithm to display the multiplication table of a given number.
11. What is the purpose of the scanf function? Explain various formats with example.
12. Differentiate while loop and do-while loop.
13. Write a C program to display the smallest elements in an array using one dimensional array.
14. What a brief note on Dynamic Memory allocation.

Question Paper format – Blooms Taxonomy Level

SECTION A - INTERNAL CHOICE				4Q X 10 M = 40 M
Question Number	Module Covered	Question	CO	BTL (Blooms Taxonomy Level)
1	Module 1	What are the different symbols used in flow charts? Design a flow chart to find the maximum of three numbers.	CO 1	Level II
2	Module 1	What are different data types supported in C with examples.	CO 1	Level II
3	Module 2	Elaborate the need for recursion. Write a program to print factorial of a number using recursion.	CO 2	Level III
4	Module 2	Explain the concept of if-else and nested if. Write a program to show the usage of both if else and nested if.	CO 2	Level III
5	Module 3	What are arrays? Explain one-dimensional array with an appropriate program	CO 3	Level IV
6	Module 3	Explain the difference between structure and union with an example	CO 3	Level IV
7	Module 4	Explain the concept of Pointers with a suitable example.	CO 4	Level III
8	Module 4	Explain various file operations and their functions in C	CO 4	Level III
SECTION B - ANSWER ANY 4 OUT OF 6 (To compulsorily have ONE question from each module)				4Q X 5 M = 20 M
9	Module 2	Explain switch case with example.	CO 2	Level III
10	Module 1	Define Algorithms and write an algorithm to display the multiplication table of a given number.	CO 1	Level II
11	Module 1	What is the purpose of the scanf function? Explain various formats with example	CO 1	Level II
12	Module 2	Differentiate while loop and do-while loop?	CO 2	Level III
13	Module 3	Write a program to accept and print single dimensional array	CO 3	Level IV
14	Module 4	What a brief note on Dynamic Memory allocation.	CO 4	Level III

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14	Module 4	What a brief note on Dynamic Memory allocation.	CO 4	Level III
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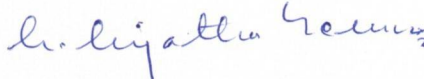
c) Question Paper Blueprint

Modules	Hours Allotted in the Syllabus	CO Addressed	Section A (No. of Questions)	Total Marks	Section B (No. of Questions)	Total Marks
1	15	CO-1	2	4x10=40	6 (By taking at least one question from each Module)	4x5=20
2	15	CO-2	2			
3	15	CO-3	2			
4	15	CO-4	2			

9. CO-PO Mapping

CO	PO	Cognitive Level	Classroom sessions (hrs)
1	1, 2	Analyze	15
2	2, 7	Understand	15
3	1, 2	Remember	15
4	1, 2	Understand	15


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PROGRAMMING IN C

Practical Syllabus

1. Course Description

Programme:	B. Sc	Max. Hours:	30
Course Code:	U26/CAP/ DSC/201/P	Hours per week:	2
Type of Course:	DSC-1	Max. Marks:	50
No. of Credits:	1		

2. Course Objectives

1. To Introduce the Fundamental Concepts of Programming through C Language.
2. To write C Programs.

3. Course Outcomes

After the successful completion of the course, the student will be able to:

CO1: To Design Simple Algorithms for Arithmetic and Logical Problems.

CO2: To Understand Conditional Branching, Iteration, Recursion, Arrays, Structures and Unions


4. Course Content

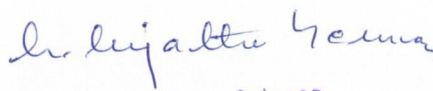
1. Program to display Area, Perimeter of circle.
2. Program to calculate Simple Interest by accepting data
3. Program to display all Data types supported by C
4. Program to find Greatest of 3 numbers using Relational operator
5. Program to swap two numbers i) using third variable ii) without using third variable
6. Program to find Minimum of 3 numbers using Ternary operator (conditional Operator)
7. Program to find Sum of first “n” Even numbers using While loop.
8. Program to find out whether given number is palindrome or not using do while
9. Program to find the Factorial of given number using for loop
10. Program to perform Arithmetic operations using Switch case

11. Program to generate Fibonacci series.
12. Program to read an array, display the elements in the in reverse order
13. Program to find maximum and Minimum number in an array
14. Program to find the Factorial of given number using recursion
15. Write a C program to multiply two matrices.
16. Write a C program to demonstrate the use of different storage classes (auto, register, static, extern).
17. Write a C program to demonstrate the concepts of call-by-value and call-by-reference
18. Write a C program that demonstrates various string functions from the library.
19. Write a C program that demonstrates structures and unions.
20. . Write a C program that opens a file and counts the total number of characters in it.
21. Write a C program that copies content from an existing text file to a new file
22. Write a C Program to swap two numbers using Pointes
23. Write a C Program to read and display the contents of File.

4. References Books

1. Programming with C, by Byron S. Gottfried, Schaum's Outline Series ,2E
2. Let Us C, by Yashwant Kanetkar, BPS Publications, 13E,
3. Programming in ANSI C, by Balaguruswamy, McGraw Hill Education, 7E
- 4.C Programming Language, by Brian W. Kernighan, Dennis M Ritchie, Pearson Publications, 2E
5. Brian W. Kernighan, Dennis M. Ritchie, The C Programming Language
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**PROGRAMMING IN C
PRACTICAL MODEL PAPER**

Course Code: U26/CAP/DSC/201/P


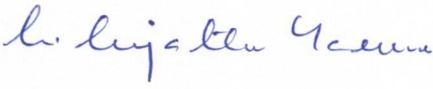

Time: 2Hrs

No. of Credits:1

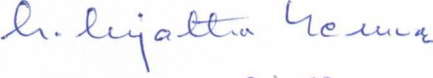
Max Marks:50

Answer any two:

1. Write a C Program to find the greatest of three numbers.
2. Write a C program to find the factorial of a given number using recursion
3. Write a C program to display the numbers of 1D array in reverse order.


Prepared by	Checked & Verified by	Approved by
 Ms. D.B Rekha Teaching faculty	 Dr. Sr. Sujatha Yeruva HoD	 Prof. Uma Joseph Principal

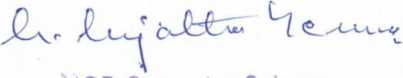

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Panel of Examiners

S.No.	B.Sc- Course Title	Examiner	Designation Place of Work	Contact No.
1.	Semester I	Dr. Teresa	Loyola Academy Secunderabad	9949099350
		Dr. Sunitha	Kasturba Gandhi Degree and PG College for Women	9676056078
		Ms T. Vamshi Mohana	RBVRR College, Narayanguda, Hyderabad	9849338286
		Mr. Subash Chander	Nizams College, Hyderabad	9505656130
2.	Semester II	Mr Mahesh	Jagruti College	8008677784
		Mr. Ramana	Bhavan's College, Sainikpuri	9949693094
		Ms. Jacintha	Loyola Academy	9908082486
		Mr. Abhishek	Nizam's College	7286834895


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