

## SEMESTER IV

## SEC-II BIOINFORMATICS

## 1. Course Description

Programme: B.Sc.  
 Course Code: U24/BIC/SEC/401  
 Type of course: SEC  
 No. of credits: 2

Max. Hours: 30  
 Hours per week: 2  
 Max. Marks: 50

## 2. Course Objectives

- This course aims to provide students with a well-rounded understanding of bioinformatics, combining biological knowledge with computational and analytical skills.
- Equip students with the tools and knowledge needed to tackle complex biological questions using computational approaches.

## 3. Course Outcomes

CO1: Examine the basics of Bioinformatics with the knowledge of Databases. (L4)

CO 2: choose the data mining of Biological Databases and design sequence analysis techniques. (L5, L6)

## 4. Course content-

**Module I: INTRODUCTION TO BIOINFORMATICS & DATA BASES** (15 hrs)

Introduction, Definition, Objectives, Scope & application. Biological databases: Primary protein databases – SWISS PROT, TrEMBL, PIR, PDB. Primary Nucleic databases – EMBL, GENBANK, DDBJ. Data mining of biological databases. Explore all the major databases and sequence retrieval from NCBI.

**Module II: SEQUENCE ANALYSIS:** (15 hrs)

Sequence alignment -FASTA, BLAST. Multiple sequence alignment – Clustal W, T-Coffee. Conserved Domains, Phylogenetic analysis and cladograms. 2D and 3D models of a given protein structure prediction. SCOP, CATH, OMIM, KEGG, PROSITE, Pfam. Physical Properties and Protein domains, Trans domain and primary structure of proteins. Introduction to Molecular Docking.

**5. Reference Books:**

1. Sharma, Munjal & Shankar, A Text Book of Bioinformatics (2008), Rastogi Publishers, First Edition, ISBN 978-81-7133-917
2. Zhumur Ghosh & Bibekan and Mallik, Bioinformatics- Principles & Applications (2008) First Edition ISBN-10: 0195692306

**6. Syllabus Focus**

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

| Local /Regional/National /Global Development Needs | Relevance                                                                                                                          |
|----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| Global                                             | With the huge availability of biological data, computational biochemistry facilitates data sharing and research on a global scale. |

b) Components on Skill Development/Entrepreneurship Development/Employability

| SD/ED/EMP | Syllabus Content | Description of Activity |
|-----------|------------------|-------------------------|
| Skill     | Module 1 & 2     | Practicals in Dry Lab   |

**7. Course Assessment Plan**

**Weightage of Marks in Formative and Summative Assessments**

| Formative Assessment - FA ( 40%)                                         | Summative Assessment - SA (60%) |
|--------------------------------------------------------------------------|---------------------------------|
| CIA-20 marks<br>Mini project/Assignment/<br>Problem solving/Case studies | End Semester exam-30Marks       |

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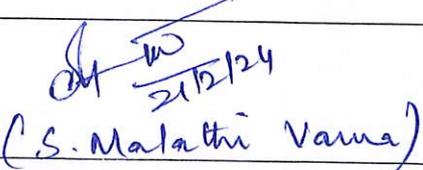
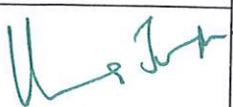
**EXTERNAL- MODEL QUESTION PAPER  
PRACTICAL**

Course Code: U24/BIC/SEC/401  
Credits: 2

Max Time: 1 Hr  
Max. Marks: 30

Answer the following.

1. Illustrate the Sequence analysis -BLAST/MSA (10M)
2. Categorize the Databases (15M)
3. Record (5M)

| SPrepared by Course Teacher<br>[Name & Signature]                                   | Checked & verified by HOD<br>[Name & Signature]                                                                          | Approved by the Principal                                                             |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|  | <br>21/12/24<br>(C.S. Malathi Varma) |  |

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St. FRANCIS COLLEGE FOR WOMEN, BEGUMPET, HYDERABAD-500016  
(An Autonomous College Affiliated To Osmania University)  
FACULTY OF SCIENCE- DEPARTMENT OF CHEMISTRY  
PRACTICAL SYLLABUS CBCS-2024  
SEMESTER -IV

**SYNTHESIS OF ORGANIC COMPOUNDS AND FUNCTIONAL GROUP ANALYSIS**

Program: B.Sc.

Course Code: U24/CHE/DSC/401/P

Course: DSC-4

No. of Credits: 1

Max. Hours: 20 Hrs

Max. Marks: 50

Hours per week: 2

**Course Objective**

- To prepare simple organic compounds and systematically analyse functional groups based on their nature and chemical reactivity.

**Course Outcomes**

CO1: Utilise the knowledge of organic reaction mechanisms in their preparations.

CO2: Categorise functional groups present in organic compounds using systematic quantitative analysis.

**Systematic Qualitative Organic Analysis of Organic Compounds** possessing mono functional groups (-COOH, phenolic, aldehydic, ketonic, carbohydrate, amide, nitro, amines) and preparation of one derivative.

**Synthesis of organic compounds:**

- Acetylation – Preparation of Acetanilide.
- Halogenation – Preparation of p-Bromo acetanilide.
- Oxidation – Preparation of Benzoic acid.
- Esterification - Preparation of n-butyl acetate.
- Methylation – Preparation  $\beta$ -Naphthyl methyl ether.
- Nitration – Preparation of Nitrobenzene
- Reduction – Preparation of m-Nitroaniline

**Reference Books:**

- Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., *Textbook of Practical Organic Chemistry*, Prentice-Hall, 5th edition, 1996.
- Mann, F.G. & Saunders, B.C. *Practical Organic Chemistry* Orient-Longman, 1960.
- Ahluwalia, V.K. & Aggarwal, R. *Comprehensive Practical Organic Chemistry*, Universities Press.

## 6. Syllabus Focus

## a. Relevance to Local, Regional, National and Global Development Needs

| Local /Regional/<br>National /Global<br>Development Needs | Relevance                                                                                                                                                          |
|-----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Local                                                     | Knowledge of the basic principles of Chemistry to help in day-to-day life.                                                                                         |
| Regional                                                  | Learn about the concepts and significance of carbohydrates and bioinorganic chemistry.                                                                             |
| National                                                  | Understand the basics of organometallic compounds, non-aqueous solvents and dipole moments.                                                                        |
| Global                                                    | Application of basic principles of rotational, IR, UV-Vis Spectroscopy techniques, concepts of chemical kinetics, heterocyclic compounds and pericyclic reactions. |

## b. Components on Skill Development/Entrepreneurship Development/Employability

| SD/ED/EMP | Syllabus Content                                                                                                                              | Description of Activity                                                                                                        |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| SD        | Practical syllabus which includes Organic preparations and Qualitative analysis in Organic Chemistry<br>Problem solving in Physical Chemistry | Students perform the experiments based on the procedure and also analyse the unknown compounds.<br>Students solve the problems |
| ED        | Organic preparations and analysis.<br>Structural investigation of organic compounds based on spectroscopy                                     | Students prepare organic compounds, analyse the functional groups and carry out the structural analysis based on spectral data |
| EMP       | Inorganic, Organic, Physical Chemistry and Spectroscopy                                                                                       | Tutorials and assignments                                                                                                      |

  
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## 7. Pedagogy

| S. No. | Student Centric Methods Adopted | Type / Description of Activity                                                            |
|--------|---------------------------------|-------------------------------------------------------------------------------------------|
| 1      | Experiential                    | Experiments, attending seminars/workshops and field visits                                |
| 2      | Participative                   | Group discussion, quiz, presentations etc.                                                |
| 3      | Problem solving                 | Solving problems in Physical Chemistry and structural elucidation based on spectral data. |

## 8. Course Assessment Plan

## a. Weightage of Marks in Continuous Internal Assessments &amp; End Semester Examination

| CO  | Continuous Internal Assessments CIA - 40%                                                                        | End Semester Examination-60% |
|-----|------------------------------------------------------------------------------------------------------------------|------------------------------|
| CO1 | CIA1-Written Exam                                                                                                | Written Exam                 |
| CO2 | CIA 2- Skill based test like poster/powerpoint presentation, collage, 3D model making, problem solving and quiz. |                              |
| CO3 | CIA1-Written Exam                                                                                                |                              |
| CO4 | CIA 2- Skill based test like poster/powerpoint presentation, collage, 3D model making, problem solving and quiz. |                              |

  
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## b. Model Question Paper - End Semester Exam

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(An Autonomous College Affiliated to Osmania University)

Faculty of Science – Department of Chemistry

MODEL PAPER

B.Sc. II YEAR SEMESTER -IV

CHEMISTRY - PAPER IV

TIME: 2 hrs

Max. Marks: 60

Course Code: U24/CHE/DSC/401

## SECTION –A (Essay Questions)

.Answer the following

4X10=40 Marks

1. a) Explain the classification of organometallic compounds based on metal-carbon bonds. (CO1) L1 5M
  - b) Discuss the reactions in liquid ammonia with suitable examples. (CO1) L2 5M
- OR
2. a) Describe the preparation, properties and applications of Grignard reagent. (CO1) L3 6M
  - b) How does fixation of carbon dioxide occur in photosynthesis? (CO1) L2 4M
  3. a) Derive an expression for the rate constant of first order reaction. (CO2) L3 5M
  - b) A first order reaction is 50% complete in 100 minutes. How long will it take for 90% completion? (CO2) L5 5M
- OR
4. Explain different methods of experimental determination of order of a reaction. (CO2) L2 10M
  5. a) Discuss the open chain structure of Glucose. (CO3) L2 5M
  - b) Write the equations involved in Killiani-Fischer synthesis. (CO3) L2 5M
- OR
6. a) Explain the synthesis of Furan, Pyrrole and Thiophene from 1,4-dicarbonyl compounds. (CO3) L2 5M
  - b) What are pericyclic reactions? Give their classification with an example each. (CO3) L4 5M
  7. a) What is a dipole moment? Predict the structure of CO<sub>2</sub> and SO<sub>2</sub> based on dipole moment. (CO4) L4 5M
  - b) Explain the various molecular vibrations seen in IR spectroscopy. (CO4) L2 5M
- OR
8. a) Describe in detail about the electronic transitions observed in UV-VIS spectroscopy. (CO4) L2 5M
  - b) Explain the basic principles of Raman spectroscopy. (CO4) L2 5M



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## SECTION -B

## II. Answer any four.

4x5=20 Marks

9. Write a note on the biological significance of calcium and chloride ions. (CO1) L1
10. Give two methods of preparation of ferrocene. (CO1) L1
11. Discuss briefly about collision theory. (CO2) L2
12. Explain the factors affecting the rate of a reaction. (CO2) L2
13. Explain mutarotation taking glucose as an example. (CO3) L2
14. Explain the concept of chromophore and auxochrome. (CO4) L2



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**b. Model Question Paper - End Semester Exam**

**St. FRANCIS COLLEGE FOR WOMEN, BEGUMPET, HYDERABAD-500016**  
 (An Autonomous College Affiliated to Osmania University)  
 Faculty of Science – Department of Chemistry  
**B.S.C. II YEAR SEMESTER -IV**

**TIME: 2 hrs**  
**Max. Marks: 60**

**Course Code: U24/CHE/DSC/401**  
**Credits: 4**

**SECTION –A (Essay Questions)**  
**SECTION –A**

| <b>SECTION A - INTERNAL CHOICE</b> |                 |                                                                                                                                                                                                  | <b>4 X 10 M = 40M</b> |                |
|------------------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|----------------|
| <b>Question Number</b>             | <b>Question</b> |                                                                                                                                                                                                  | <b>CO</b>             | <b>BTL</b>     |
| 1                                  | <b>Module 1</b> | a) Explain the classification of organometallic compounds based on metal-carbon bonds. 5M<br>b) Discuss the reactions in liquid ammonia with suitable examples. 5M<br><b>OR</b>                  | CO 1                  | (Level I,II)   |
| 2                                  | <b>Module 1</b> | a) Describe the preparation, properties and applications of Grignard reagent. 6M<br>b) How does fixation of carbon dioxide occur in photosynthesis? 4M                                           | CO 1                  | (Level III,II) |
| 3                                  | <b>Module 2</b> | a) Derive an expression for the rate constant of first order reaction. 5M<br>b) A first order reaction is 50% complete in 100 minutes. How long will it take for 90% completion? 5M<br><b>OR</b> | CO 2                  | (Level III, V) |
| 4                                  | <b>Module 2</b> | Explain different methods of experimental determination of order of a reaction. 10M                                                                                                              | CO 2                  | (Level II)     |
| 5                                  | <b>Module 3</b> | a) Discuss the open chain structure of Glucose. 5M<br>b) Write the equations involved in Killiani-Fischer synthesis. 5M<br><b>OR</b>                                                             | CO 3                  | (Level II)     |

|                                          |          |                                                                                                                                                                                                             |                      |                |
|------------------------------------------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------|
| 6                                        | Module 3 | a) Explain the synthesis of Furan, Pyrrole and Thiophene from 1,4-dicarbonyl compounds. (CO3) L2 5M<br>b) What are pericyclic reactions? Give their classification with an example each. (CO3) 5M           | CO 3                 | (Level II, IV) |
| 7                                        | Module 4 | a) What is a dipole moment? Predict the structure of CO <sub>2</sub> and SO <sub>2</sub> based on dipole moment. 5M<br>b) Explain the various molecular vibrations seen in IR spectroscopy. 5M<br><b>OR</b> | CO 4                 | (Level II, IV) |
| 8                                        | Module 4 | a) Describe in detail about the electronic transitions observed in UV-VIS spectroscopy. 5M<br>b) Explain the basic principles of Raman spectroscopy. 5M                                                     | CO 4                 | (Level II)     |
| <b>SECTION B - ANSWER ANY 4 OUT OF 6</b> |          |                                                                                                                                                                                                             | <b>4 X 5M = 20 M</b> |                |
| 9                                        | Module 2 | Write a note on the biological significance of calcium and chloride ions.                                                                                                                                   | CO 1                 | (Level I)      |
| 10                                       | Module 1 | Give two methods of preparation of ferrocene.                                                                                                                                                               | CO 1                 | (Level I)      |
| 11                                       | Module 2 | Discuss briefly about collision theory.                                                                                                                                                                     | CO 2                 | (Level II)     |
| 12                                       | Module 2 | Explain the factors affecting the rate of a reaction.                                                                                                                                                       | CO 2                 | (Level II)     |
| 13                                       | Module 3 | Explain mutarotation taking glucose as an example.                                                                                                                                                          | CO 3                 | (Level II)     |
| 14                                       | Module 4 | Explain the concept of chromophore and auxochrome.                                                                                                                                                          | CO 4                 | (Level II)     |

  
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**SEMESTER - IV**  
**DATA ANALYSIS AND VISUALIZATION**

**1. Course Description:**

Programme: B.Sc./B.Com./BMS

Max. Hours: 30

Course Code: U24/CSC/SEC/401

Hours per week: 2

Course Type: SKILL ENHANCEMENT COURSE

Max. Marks: 50

No. of credits: 2

**2. Course Objectives:**

- To learn the skills for working with formulas, functions, named ranges, referencing cells, and auditing for effective data analysis and manipulation.
- To learn the skills required for case analysis of different scenarios using the tools for analysis and visualisation.

**3. Course Outcomes:**

This SEC paper will help students to enhance their overall skills and to

**CO1: *Apply*** formulas, functions, and named ranges for effective data manipulation to Demonstrate Excel Data Analysis Proficiency. (Cognitive level – 3)

**CO2: *Demonstrate*** ability to employ analytical tools and visualization techniques to extract insights and present findings effectively. (Cognitive level – 3)



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#### **4. Course Content**

##### **MODULE I: DATA REPRESENTATION**

**(15 Hrs)**

Review of Excel-Worksheet Basics, Protecting Workbook, Importing and Exporting data, Sharing in Excel; Formula sand functions – understanding formulas; operators in formula; named ranges; calculations; functions in formulas; relative and absolute addressing; referencing cells outside the worksheet and workbook; functions- logical, summarizing, text, lookup, reference, data and time, math functions; error handling, formula auditing.

##### **MODULE II: DATA VISUALIZATION**

**(15 Hrs)**

Charts–waterfall, histogram, pareto, box and whisker, Tree map, sunburst, sparkline,3D map charts and their uses; Advanced charts -Milestone chart, SmartArt graphics, Organization chart. Pivot tables–verify data source, format data, recommended pivot tables, adding slicers, timelines, calculated fields and group fields in pivot.

#### **5. References**

1. Manisha Nigam, “Data Analysis with Excel”, BPP publications, 2018



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**6. Syllabus Focus:****a) Relevance to Local, Regional, National and Global Development Needs**

| Local/Regional/National/Global Development Needs | Relevance                                                                                                                                                                                                                         |
|--------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Global Development                               | Data Analysis is a systematic method to look for trends, groupings, or other relationships between different types of data. Data visualization is to make it easier to identify patterns, trends and outliers in large data sets. |

**b) Components on Skill Development/Entrepreneurship Development/Employability**

| SD/ED/EMP  | Syllabus Content | Description of Activity                                                                                                                                                                                                                                                                                                  |
|------------|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SD and EMP | Modules 1 and 2  | <p>Proficiency in Excel for worksheet management, data importing/ exporting, sharing, formula understanding, error handling and auditing for effective data analysis and manipulation.</p> <p>Proficiency in creating and utilizing various types of charts and understanding their purposes for data visualization.</p> |

**7. Course Assessment Plan:****a) Weightage of Marks in Formative and Summative Assessments**

| Formative Assessment - FA (40%)                                                   | Summative Assessment - SA (60%) |
|-----------------------------------------------------------------------------------|---------------------------------|
| CIA-20 marks<br>Mini project/Written Assignment /<br>Problem solving/Case studies | End Semester Exam – 30 Marks    |

  
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## b) Question Paper Pattern

**EXTERNAL- MODEL QUESTION PAPER**  
**PRACTICAL**

**Course code: U24/CSC/SEC/401**  
**Credits:2**

**Max. Marks: 30**  
**Max Time: 1 Hr**

**I. Answer the following.**

1. Refer the excel worksheet shared and perform the below tasks: **(15M)**
- Apply conditional Formatting for Total column and find how many students Mark1 is greater than 42.
  - Calculate total and Percentage.
  - Use VLOOKUP function to find the name of the student with Roll No 12823.
  - Use IF CONDITION for Pass/fail. If Percentage greater than 72 "Pass" else "Fail".
  - Add a new column as Full name and fill the data using CONCATENATE function.
2. Draw a sparkline chart for the following chart **( 15M)**

| Month        | Jan      | feb      | Mar       | Apr       | may       | jun      |
|--------------|----------|----------|-----------|-----------|-----------|----------|
| Revenue 2020 | 785<br>0 | 890<br>0 | -<br>8700 | -<br>740  | -<br>7463 | 784<br>1 |
| Revenue 2021 | 790<br>0 | 500<br>8 | -<br>4700 | -<br>4500 | -<br>4850 | 795<br>8 |
| Revenue 2022 | 800<br>0 | 670<br>0 | -<br>4000 | -<br>7200 | -<br>5300 | 890<br>0 |

| Prepared by                                                                                                                                 | Checked & Verified by                                                                                                       | Approved by                                                                                                                        |
|---------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| <br><b>Ms. Afeela Noorain</b><br><b>Teaching Faculty</b> | <br><b>Ms. D. Sowjanya</b><br><b>HOD</b> | <br><b>Dr. Uma Joseph</b><br><b>Principal</b> |

  
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## SEMESTER-1V

## ENDOCRINOLOGY &amp; MOLECULAR BIOLOGY

## 1. Course Description

Programme : B.Sc.  
Course Code : U24/BIC/DSC/401  
Type of course: DSC  
No. of credits : 4

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

## 2. Course Objectives

- To discuss cellular mechanisms related to the molecular basis of life.
- To infer the molecular, biochemical, and physiological effects of hormone on cells and tissues.

## 3. Course Outcomes:

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

- CO1:** Outline the different classes and chemical structures of hormones, glands, organs, tissues, and cells that synthesize and secrete hormones, precursors and associated compounds, synthesis and regulation. (L1)
- CO2:** Describe the different steps in the central dogma of molecular biology, gene expression and emphasize the enzymes involved in the process. (L2)
- CO3:** Apply clear knowledge in techniques of Molecular biology which includes PCR, Hybridization, and blotting & sequencing techniques. (L3)
- CO4:** Analyze the nature of signals, sorting and applications like Recombinant DNA technology. (L4)

  
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## 4. Course Content

**Module I: ENDOCRINOLOGY**

(15hrs)

Organisation of endocrine system. Definition and Classification of Hormones based on composition & mode of action. Outline of chemistry, physiological role and disorders of hormones of hypothalamus, pituitary, thyroid, adrenal, parathyroid, gonads, pancreas, and placenta. Introduction to gastrointestinal hormones. Mechanism of hormone action – Signal transduction pathways for adrenaline, glucocorticoids, and insulin.

**Module II: REPLICATION & TRANSCRIPTION**

(15hrs)

General features of mechanism of DNA replication, models of DNA replication, Experimental evidence of semi conservative model - Meselson Stahl experiment. Replicosome. Mechanism of transcription – RNA synthesis, RNA polymerase of prokaryotes. DNA polymerases I, II and III of *E. coli*, helicase, topoisomerases, primase, ligase. Bidirectional replication model. Okazaki fragments, leading and lagging strands of DNA synthesis. Inhibitors of DNA replication.

Promoters, Initiation - sigma factors and their recognition sites. Elongation – role of core enzymes. Termination – rho dependent and rho independent. RNA polymerase I, II III of eukaryotes Inhibitors of transcription. Post transcriptional modification – 5'α - amanitin.

Comparison of transcription in prokaryotes & eukaryotes.

**Module III: PROTEIN SYNTHESIS & REGULATION OF GENE EXPRESSION** (15hrs)

Transcription - RNA synthesis, RNA polymerases of prokaryotes. Promoters, Initiation- sigma factors and their recognition sites. Elongation- role of core enzyme. Termination- rho dependent and rho independent. RNA polymerase I, II and III of eukaryotes. Translation machinery, mechanism of translation, polysomes, inhibitors of protein synthesis.

Post translational modifications and their significance. Basic principles of protein sorting, Signal hypothesis & protein secretion. Regulation of gene expression – promoter, operator, repressor binding in DNA. Lac Operon - Control by negative and positive regulatory proteins.

**Module IV: RECOMBINANT DNA TECHNOLOGY**

(15hrs)

Creation of a recombinant molecule – general outline. Restriction endonucleases – types, uses, Ligases, phosphatases, reverse transcriptase, polynucleotide kinases, terminal transferase, nucleases-S1 and RNAase H. Restriction mapping. Salient features of cloning vectors – plasmids, Ti plasmids, cosmids, lambda phage vectors & virus vectors, Insertion vectors, expression vectors, Shuttle vectors. Introduction of Recombinant DNA to host cells by various modes like transformation, transfection, microinjection, liposome, encapsulation etc. selection of

transformed cells. Sequencing of nucleic acids – Sanger’s and Maxam – Gilbert methods. Principles & Techniques of hybridization - Colony hybridization, NA Hybridization. Blotting techniques – Southern, Northern and Western blotting techniques. Polymerase chain reaction and its applications.

## 5. Reference Books

1. Lodish: Molecular Cell Biology, 5<sup>th</sup> Edition (2003) Freeman, W. H. & Company.  
ISBN- 13: 2900716743667
2. Devlin : Textbook of Biochemistry with Clinical Correlations (2011),  
T.M. John Wiley & Sons, Inc. (New York)
3. Campbell, Biochemistry (1995) 3<sup>rd</sup> Edition, Publisher: John Vondeling.  
ISBN: 0-03-02-44-269
4. P.K Gupta, Biotechnology and Genomics, Rastogi Publications. (2004)  
ISBN: 81-7133-67-6-0.

## 6. Syllabus Focus

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

| Local /Regional/National /Global Development Needs | Relevance                                                                                                                             |
|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| Global                                             | Endocrinology is crucial for hormone balance, cell and organ communication, pivotal in understanding and treating medical conditions. |
| Global                                             | The knowledge of molecular mechanisms helps in identifying the underlying causes of health and disease.                               |

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## b) Components on Skill Development/Entrepreneurship, Development/Employability

| SD/ED/EMP                    | Syllabus Content                                                                                               | Description of Activity                                                                   |
|------------------------------|----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| SD-Module 1                  | Chemistry of various hormones in the body and their physiological role                                         | Lecture- Identifying, analyzing and troubleshooting the hormonal defects                  |
| ED<br>Module 2,3             | Molecular biology techniques                                                                                   | Practicals                                                                                |
| Entrepreneurship<br>Module 4 | Sequencing of nucleic acids<br>Techniques of hybridization<br>Blotting techniques<br>Polymerase chain reaction | Lecture-Equip the students with the knowledge of the most important tools in biochemistry |

## 7. Pedagogy

| S. No | Type/Description of Activity | Student Centric Methods Adopted |
|-------|------------------------------|---------------------------------|
| 1.    | Seminar                      | Participative Learning          |
| 2.    | Model making/Art projects    | Experiential Learning           |
| 3.    | Quiz                         | Experiential Learning           |

## 8. Course Assessment Plan

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

| COs | Continuous Internal Assessments – CIA<br>(40%) | End Semester Examination<br>(60%) |
|-----|------------------------------------------------|-----------------------------------|
| CO1 | CIA-1                                          | End Semester examination          |
| CO2 | CIA-1                                          |                                   |
| C03 | CIA-2 -Objective test                          |                                   |
| C04 | CIA-2 - Assignment/ model making/ PPT          |                                   |

## b) Model Question Paper

## ENDOCRINOLOGY &amp; MOLECULAR BIOLOGY

Code : U24/BIC/DSC/401  
Credits: 4

Max Marks : 60  
Time : 2hrs

## I. Answer the following questions

(4x10=40M)

1. (a) Outline and discuss the hormones involved in calcium metabolism.  
(OR)  
(b) Explain the mechanism involved in hormone action.
2. (a) Discuss in detail the different enzymes involved in DNA replication.  
(OR)  
(b) Explain the mechanism of transcription in prokaryotes.
3. (a) Explain the initiation process of protein synthesis in prokaryotes.  
(OR)  
(b) Summarise signal peptide hypothesis with diagram.
4. (a) Assess the principle, procedure and applications of southern blotting.  
(OR)  
(b) Examine in detail the sequencing of nucleic acids by Maxam and Gilbert's method.

## II. Write Short notes on any 4 questions

(4x5=20M)

5. Classification of Hormones
6. Gastro intestinal Hormone
7. Post transcriptional modifications
8. Clover leaf model of t-RNA
9. Lac operon
10. Chaperons



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**GUIDELINES FOR MODEL PAPER SETTING  
AS PER BLOOMS TAXONOMY LEVEL (BTL)**

**Semester IV: Molecular Biology & Endocrinology**

| <b>SECTION A - INTERNAL CHOICE (4 X 10 M = 40 M)</b>                                                             |                 |                                                                                  |           |                                    |
|------------------------------------------------------------------------------------------------------------------|-----------------|----------------------------------------------------------------------------------|-----------|------------------------------------|
| <b>Question Number</b>                                                                                           | <b>Question</b> | <b>Question</b>                                                                  | <b>CO</b> | <b>BTL (Blooms Taxonomy Level)</b> |
| 1                                                                                                                | Module 1        | Outline and discuss the hormones involved in calcium metabolism                  | CO 1      | 1,2                                |
| 2                                                                                                                | Module 1        | Explain the mechanism involved in hormone action.                                | CO 1      | 2                                  |
| 3                                                                                                                | Module 2        | Discuss in detail the different enzymes involved in DNA replication.             | CO 2      | 2                                  |
| 4                                                                                                                | Module 2        | Explain the mechanism of transcription in prokaryotes.                           | CO 2      | 2                                  |
| 5                                                                                                                | Module 3        | Explain the initiation process of protein synthesis in prokaryotes.              | CO 3      | 2                                  |
| 6                                                                                                                | Module 3        | Summarise signal peptide hypothesis with diagram.                                | CO 3      | 2                                  |
| 7                                                                                                                | Module 4        | Describe the principle, procedure and applications of southern blotting          | CO 4      | 2                                  |
| 8                                                                                                                | Module 4        | Explain in detail the sequencing of nucleic acids by Maxam and Gilbert's method. | CO 4      | 2                                  |
| <b>SECTION B - ANSWER ANY 4 OUT OF 6 (4Q X 5M = 20M)</b><br>(To compulsorily have ONE question from each module) |                 |                                                                                  |           |                                    |
| 9                                                                                                                | Module 1        | Classification of Hormones                                                       | CO 1      | 1                                  |
| 10                                                                                                               | Module 2        | Gastro intestinal Hormone                                                        | CO 1      | 1                                  |
| 11                                                                                                               | Module 3        | Post transcriptional modifications                                               | CO 2      | 2                                  |
| 12                                                                                                               | Module 2        | Clover leaf model of t-RNA                                                       | CO 3      | 2                                  |
| 13                                                                                                               | Any Module      | Lac operon                                                                       | CO 4      | 3                                  |
| 14                                                                                                               | Any Module      | Chaperons                                                                        | CO3       | 3                                  |

**PRACTICAL**  
**ENDOCRINOLOGY & MOLECULAR BIOLOGY**

**1. Course Description:**

**Programme:** B.Sc.  
**Course Code:** U24/BIC/DSC/401/P  
**Type of course:** DSC 4  
**No. of credits:** 1

**Max. Hours:** 30  
**Hours per week:** 2  
**Max.Marks:** 50

**2. Course objective:**

- To demonstrate the knowledge of molecular biology and related techniques in the current research fields.

**3. Course Outcome:**

This course will help the students to-

**CO1:** Apply the knowledge of different electrophoresis to separate DNA, RNA and protein molecules. (L3)

**CO2:** Probe the skills of various molecular biology techniques(L4).

**CO3:** To assess the importance of various Hormones(L5)

**PRACTICAL SESSION**

1. Detection of HCG/TSH Hormone.
2. Estimation of DNA by DPA Method
3. Estimation of RNA by Orcinol Method
4. Isolation of DNA from Rice Leaves
5. Determination of Purity of Isolated DNA by UV Spectrophotometer
6. Isolation of DNA from Goat Liver
7. Electrophoresis of Standard DNA.
8. Restriction Digestion of DNA and their Size Determination.
9. Isolation of Plasmid
10. Separation of Proteins by SDS – PAGE
11. PCR (Demo)

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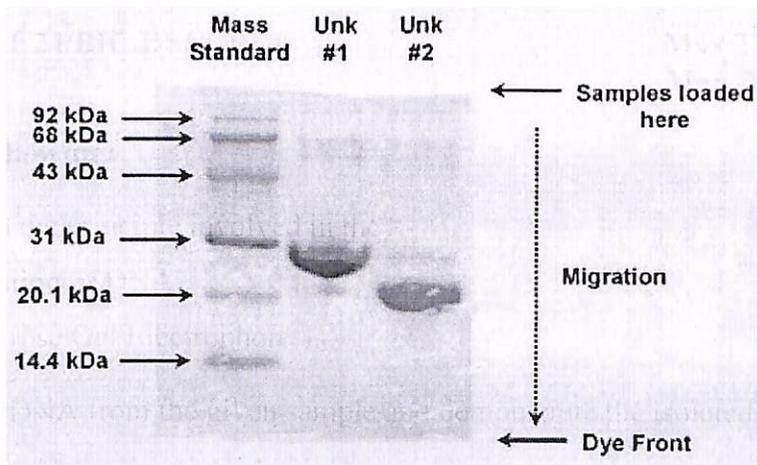
**MODEL QUESTION PAPER  
PRACTICAL**

**Course Code: U24/BIC/DSC/401/P**  
**Credits: 1**

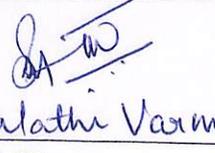
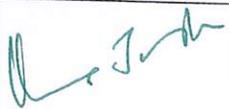
**Max Time: 2 Hrs**  
**Max. Marks: 50**

**Answer the following:**

1. Explain the principle involved in the
  - a. Isolation of DNA (5 M)
  - b. Agarose Gel Electrophoresis (5 M)
2. Isolate DNA from the given sample and demonstrate the isolated DNA on Agarose gel (20 M)
3. Determine the molecular weight of unknown using the SDS-PAGE given below (10 M)



4. Record (5 M)
5. Viva (5 M)

| Prepared by Course Teacher<br>[Name & Signature]                                                          | Checked & verified by<br>HOD<br>[Name & Signature]                                                        | Approved by<br>the Principal                                                          |
|-----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| <br>(S. Malathi Varma) | <br>(S. Malathi Varma) |  |

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## SEMESTER - IV

## INTRODUCTION TO RDBMS AND SQL

**1. Course Description**

Programme: B.Sc.

Course Code: U24/CAP/DSC/401

Course Type: DISCIPLINE SPECIFIC CORE

No. of credits: 4

Max. Hours: 60

Hours per week: 4

Max. Marks: 100

**2. Course Objectives**

- To learn the basic concepts and the applications of database systems.
- To Understand the relational database design principles.
- To Master the basics of SQL and construct queries using SQL.
- To understand database security and maintenance issues.

**3. Course Outcomes**

On completion of the course the student will be able to:

**CO1: *Illustrate* and *explain*** the basic elements of a relational database management system.

(Cognitive level – 2)

**CO2: *Choose* and *draw*** Entity-Relationship diagrams to represent simple database application scenarios (Cognitive level - 5) and ***Design*** SQL queries for a given context in relational database

(Cognitive level – 6)

**CO3: *Demonstrate*** the process of Normalization in databases. (Cognitive level – 3)**CO4: *Analyse*** database security threats. (Cognitive level – 4)

  
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**4. Course Content****MODULE I: INTRODUCTION TO DATABASE (15 Hrs)**

Introduction to Databases: Introduction, Traditional File-Based Systems, Database Approach, Roles in the Database Environment, Advantages and Disadvantages of DBMSs, The Three-Level ANSI-SPARC Architecture, Database Languages, Data Models, Functions of a DBMS, Relational Model- Integrity Constraints, Views .

**MODULE II: ENTITY-RELATIONSHIP MODEL &SQL (15 Hrs)**

Entity–Relationship Modelling: Entity Types, Relationship Types, Attributes, Keys, Strong and Weak Entity Types. Introduction to SQL, SQL Data Types, Data Definition – Create, Alter, Drop Commands, SQL Data Manipulation – Simple Queries, Insert, Update, Delete Data, Sorting results, Aggregate Functions, Grouping results, Multi Table Queries – Simple Join, Outer Joins, Full Outer Joins.

**MODULE III: NORMALIZATION (15 Hrs)**

Functional–Dependencies- Anomalies, Partial Functional Dependency, Transitive Functional Dependency; Normalization- The Purpose of Normalization, Data Redundancy, Update and delete Anomalies, The Process of Normalization, First Normal Form (1NF), Second Normal Form (2NF), Third Normal Form (3NF).

**MODULE V: DATABASE SECURITY (15 Hrs)**

Database security – threats, counter measures - authorization, access controls, views, backup and recovery, integrity, encryption, RAID.

**5. References**

1. Connolly, Thomas; Begg, Carolyn, "Database Systems A Practical Approach to Design, Implementation and Management 4/E", Pearson, 2008
2. Fundamentals of Relational Databases, Ramon a Mata-Toledo, Pauline k Cushman, Schaum's outline series, McGraw hill, 1/E, 2000.
3. Database System Concepts, Abraham Silberschatz, Henry F.Korth,S.Sudarshan, McGraw Hill Education, 6/E, 2010.
4. Fundamentals of Database Systems, Rameez Elmasri and Shamkant B Navathe, Pearson, 6/E, 2011.



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**6. Syllabus Focus****a) Relevance to Local, Regional, National and Global Development Needs**

| Local /Regional/National /Global Development Needs | Relevance                                                                                                                                                            |
|----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Global Development                                 | RDBMS provides an interface between users and applications and the database, as well as administrative functions for managing data storage, access, and performance. |

**b) Components on Skill Development/Entrepreneurship Development/Employability**

| SD/ED/EMP | Syllabus Content | Description of Activity                                                                                       |
|-----------|------------------|---------------------------------------------------------------------------------------------------------------|
| SD        | Modules 1 and 2  | Understanding basic RDBMS concepts like data models, keys and relational operations, constructing SQL queries |
| EMP       | Modules 3 and 4  | Applying the concepts of normalization, database security and maintenance.                                    |

**7. Pedagogy**

| S. No | Student Centric Methods Adopted | Type / Description of Activity |
|-------|---------------------------------|--------------------------------|
| 1.    | Participative                   | Seminars                       |
| 2.    | Experimental                    | Quiz                           |
| 3.    | Problem solving                 | Lab Exercises                  |

  
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**8. Course Assessment Plan****a) Weightage of Marks in Continuous Internal Assessments and Written Exam**

| CO  | Continuous Internal Assessments CIA -40% | Written Exam-60% |
|-----|------------------------------------------|------------------|
| CO1 | CIA 1 – Written Test                     | Written Exam     |
| CO2 | CIA 2 – Written Test                     |                  |
| CO3 | CIA 2 – Written Assignment               |                  |
| CO4 | CIA 3 – Lab Test                         |                  |



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**b) Model Question Paper- End Semester Exam****INTRODUCTION TO RDBMS and SQL****Course code: U24/CAP/DSC/401****Credits:4****Max. Marks: 60****Time: 2 Hrs****SECTION-A****I. Answer the following****4X10=40M**

1. What are database Systems? Explain functions of DBMS.

OR

2. Explain advantages of Database management systems.

3. Create a table STUDENT with under mentioned structure by using SQL

Statement:

|            |                |                     |
|------------|----------------|---------------------|
| StdID      | Number         | Primary Key         |
| StdName    | Character (30) | NOT NULL            |
| Gender     | Character (6)  | Male or Female      |
| Percentage | Number         |                     |
| SClass     | Number         |                     |
| Sec        | Character      |                     |
| Stream     | Character (10) | Science or Commerce |
| DOB        | Date           | Date of Birth       |

- Insert 5 records.
- Delete a record from the table with repeating DOB.
- Alter table to add a column fee number.

OR

4. Explain the terms entities and attributes, relationships.

5. Explain 1NF, 2NF and 3NF with suitable examples.

OR

6. Explain Functional Dependencies, Database anomalies and types of Functional Dependencies with examples

7. Explain the countermeasures of database security.

OR

8. Explain RAID levels.

**SECTION B****II. Answer any 4 questions:****4 x 5 = 20M**

9. Explain different types to Join operations.

10. Explain primary key and foreign key.

11. Explain the types of attributes in the E-R model with an example.

12. Explain the data definition language commands in SQL.

13. Explain different types of access controls in database security.

14. Explain three level architecture.



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**INTRODUCTION TO RDBMS and SQL**  
**PRACTICAL**

**1. Course Description****Programme: B.Sc.****Max. Hours: 30****Course Code: U24/CAP/DSC/401/P****Hours per week: 2****Course Type: DISCIPLINE SPECIFIC CORE****Max. Marks: 50****No. of credits: 1****2. Course Objectives**

- This course provides the student with a study of database design and implementation and a comparison of basic models.
- It also discusses query languages, issues of integrity, security, dependencies, and normal forms.

**PRACTICAL SESSIONS**

1. To create a document and implement various text and tables features
2. Introduction to SQL – Creation of Database, DML, DDL, DCL
3. Creating Tables with Primary Key, Inserting Records, Simple SELECT
4. Foreign Key and other constraints-Inserting records, Simple SELECT
5. SELECT with WHERE clause using Operators - Arithmetic, Relational, Comparison Operators.
6. SELECT with WHERE clause using Operators - Character, Miscellaneous and Set Operators.
7. Functions - Aggregate, Math.
8. Functions - String & Date Functions.
9. Practice on SELECT with WHERE clause using – Relational Operators, AND, OR, IN.
10. Practice on SELECT with WHERE clause using – BETWEEN, LIKE, NOT
11. Altering the table structure-ALTER command.
12. DROP command to drop a table record.
13. ORDER BY, DISTINCT clause - Use Order by Clause to arrange the data in ascending or descending order GROUP BY with HAVING Clause.
14. DML Commands - Updating table entries, Deleting table entries
15. JOINS - extracts information from two or more tables.

  
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**INTRODUCTION TO RDBMS AND SQL****PRACTICAL**

**Course Code: U24/CAP/DSC/401/P**  
**Credits: 1**

**Max Marks: 50**  
**Times: 2 Hrs**

**I. Answer the following:**

1. i) Create a database and create the tables with constraints.  
ii) Insert a row into the table supplying data for all columns.

Hotel (hotelNo, hotelName, city)

Room(RoomNo, hotelNo, type, price, guestNo, guestName, guestAddress, dateFrom, dateTo)

**Queries:**

2. List full details of all hotels in London.
3. Add new column contact number in Room
4. Update the values for query 3.
5. List all double or family rooms with a price below 4000 per day, in ascending order of price.
6. List the number of rooms in each hotel.
7. What is the average price of a room?
8. Delete record from the database using DELETE
9. What is the average number of bookings for each hotel in August?
10. List all the booked dates without repetition.
11. What is the total revenue per day from all double rooms?
12. List all hotelno, hotelname, roomno, type and price (Equi Join).
13. List all hotelno, hotelname, city, type, roomno for price greater than 3500(Non Equi Join).



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(An Autonomous College Affiliated To Osmania University)

FACULTY OF SCIENCE- DEPARTMENT OF CHEMISTRY

PRACTICAL SYLLABUS CBCS-2024

SEMESTER -IV

**SYNTHESIS OF ORGANIC COMPOUNDS AND FUNCTIONAL GROUP ANALYSIS**

Program: B.Sc.

Course Code: U24/CHE/DSC/401/P

Course: DSC-4

No. of Credits: 1

Max. Hours: 20 Hrs

Max. Marks: 50

Hours per week: 2

**Course Objective**

- To prepare simple organic compounds and systematically analyse functional groups based on their nature and chemical reactivity.

**Course Outcomes**

CO1: Utilise the knowledge of organic reaction mechanisms in their preparations.

CO2: Categorise functional groups present in organic compounds using systematic quantitative analysis.

**Systematic Qualitative Organic Analysis of Organic Compounds** possessing mono functional groups (-COOH, phenolic, aldehydic, ketonic, carbohydrate, amide, nitro, amines) and preparation of one derivative.

**Synthesis of organic compounds:**

- Acetylation – Preparation of Acetanilide.
- Halogenation – Preparation of p-Bromo acetanilide.
- Oxidation – Preparation of Benzoic acid.
- Esterification - Preparation of n-butyl acetate.
- Methylation – Preparation  $\beta$ -Naphthyl methyl ether.
- Nitration – Preparation of Nitrobenzene
- Reduction – Preparation of m-Nitroaniline

**Reference Books:**

- Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., *Textbook of Practical Organic Chemistry*, Prentice-Hall, 5th edition, 1996.
- Mann, F.G. & Saunders, B.C. *Practical Organic Chemistry* Orient-Longman, 1960.
- Ahluwalia, V.K. & Aggarwal, R. *Comprehensive Practical Organic Chemistry*, Universities Press.

## 6. Syllabus Focus

## a. Relevance to Local, Regional, National and Global Development Needs

| Local /Regional/<br>National /Global<br>Development Needs | Relevance                                                                                                                                                          |
|-----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Local                                                     | Knowledge of the basic principles of Chemistry to help in day-to-day life.                                                                                         |
| Regional                                                  | Learn about the concepts and significance of carbohydrates and bioinorganic chemistry.                                                                             |
| National                                                  | Understand the basics of organometallic compounds, non-aqueous solvents and dipole moments.                                                                        |
| Global                                                    | Application of basic principles of rotational, IR, UV-Vis Spectroscopy techniques, concepts of chemical kinetics, heterocyclic compounds and pericyclic reactions. |

## b. Components on Skill Development/Entrepreneurship Development/Employability

| SD/ED/EMP | Syllabus Content                                                                                                                              | Description of Activity                                                                                                        |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| SD        | Practical syllabus which includes Organic preparations and Qualitative analysis in Organic Chemistry<br>Problem solving in Physical Chemistry | Students perform the experiments based on the procedure and also analyse the unknown compounds.<br>Students solve the problems |
| ED        | Organic preparations and analysis. Structural investigation of organic compounds based on spectroscopy                                        | Students prepare organic compounds, analyse the functional groups and carry out the structural analysis based on spectral data |
| EMP       | Inorganic, Organic, Physical Chemistry and Spectroscopy                                                                                       | Tutorials and assignments                                                                                                      |

  
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## 7. Pedagogy

| S. No. | Student Centric Methods Adopted | Type / Description of Activity                                                            |
|--------|---------------------------------|-------------------------------------------------------------------------------------------|
| 1      | Experiential                    | Experiments, attending seminars/workshops and field visits                                |
| 2      | Participative                   | Group discussion, quiz, presentations etc.                                                |
| 3      | Problem solving                 | Solving problems in Physical Chemistry and structural elucidation based on spectral data. |

## 8. Course Assessment Plan

## a. Weightage of Marks in Continuous Internal Assessments &amp; End Semester Examination

| CO  | Continuous Internal Assessments CIA - 40%                                                                        | End Semester Examination-60% |
|-----|------------------------------------------------------------------------------------------------------------------|------------------------------|
| CO1 | CIA1-Written Exam                                                                                                | Written Exam                 |
| CO2 | CIA 2- Skill based test like poster/powerpoint presentation, collage, 3D model making, problem solving and quiz. |                              |
| CO3 | CIA1-Written Exam                                                                                                |                              |
| CO4 | CIA 2- Skill based test like poster/powerpoint presentation, collage, 3D model making, problem solving and quiz. |                              |

  
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## b. Model Question Paper - End Semester Exam

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Faculty of Science – Department of Chemistry

MODEL PAPER

B.Sc. II YEAR SEMESTER -IV

CHEMISTRY - PAPER IV

TIME: 2 hrs

Course Code: U24/CHE/DSC/401

Max. Marks: 60

## SECTION –A (Essay Questions)

.Answer the following

4X10=40 Marks

1. a) Explain the classification of organometallic compounds based on metal-carbon bonds. (CO1) L1 5M  
b) Discuss the reactions in liquid ammonia with suitable examples. (CO1) L2 5M
- OR
2. a) Describe the preparation, properties and applications of Grignard reagent. (CO1) L3 6M  
b) How does fixation of carbon dioxide occur in photosynthesis? (CO1) L2 4M
  3. a) Derive an expression for the rate constant of first order reaction. (CO2) L3 5M  
b) A first order reaction is 50% complete in 100 minutes. How long will it take for 90% completion? (CO2) L5 5M
- OR
4. Explain different methods of experimental determination of order of a reaction. (CO2) L2 10M
  5. a) Discuss the open chain structure of Glucose. (CO3) L2 5M  
b) Write the equations involved in Killiani-Fischer synthesis. (CO3) L2 5M
- OR
6. a) Explain the synthesis of Furan, Pyrrole and Thiophene from 1,4-dicarbonyl compounds. (CO3) L2 5M  
b) What are pericyclic reactions? Give their classification with an example each. (CO3) L4 5M
  7. a) What is a dipole moment? Predict the structure of CO<sub>2</sub> and SO<sub>2</sub> based on dipole moment. (CO4) L4 5M  
b) Explain the various molecular vibrations seen in IR spectroscopy. (CO4) L2 5M
- OR
8. a) Describe in detail about the electronic transitions observed in UV-VIS spectroscopy. (CO4) L2 5M  
b) Explain the basic principles of Raman spectroscopy. (CO4) L2 5M



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Dept. of Chemistry

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## SECTION -B

## II. Answer any four.

4x5=20 Marks

9. Write a note on the biological significance of calcium and chloride ions. (CO1) L1
10. Give two methods of preparation of ferrocene. (CO1) L1
11. Discuss briefly about collision theory. (CO2) L2
12. Explain the factors affecting the rate of a reaction. (CO2) L2
13. Explain mutarotation taking glucose as an example. (CO3) L2
14. Explain the concept of chromophore and auxochrome. (CO4) L2

  
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