SEMESTER – I
BACTERIOLOGY AND SYSTEMATICS - THEORY

1. Course Description:

Programme: B.Sc.
Course Code: U24/MIC/DSC/101
Course Type: DSC
No. of credits: 4

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

2. Course Objectives:

- To recognize, identify and differentiate the internal and external structures of bacterial cell.
- To enable the student to learn morphology, ecology, genetics and biochemistry of bacteria as well as many other aspects related to them.

3. Course Outcomes:

CO 1: Understand the Scope, importance of different branches of microbiology and diversity of microbial world to differentiate between Prokaryotes and Eukaryotes. (L II)

CO 2: Understand Bacterial taxonomy and general characters of different groups of microorganism. (L II)

CO 3: Apply the principles and handling of microscope to identify and differentiate between Gram Positive and Gram negative bacterial cell structure. (L III)

CO 4: Analyse different types of media and sterilization techniques. (L IV)

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4. Course Content:

MODULE I - HISTORY OF MICROBIOLOGY: (15 Hrs)

Scope and importance of Microbiology, Different branches of Microbiology, importance of microorganisms in human welfare, spontaneous generation- biogenesis theory, Germ theory of diseases. Important contributions of Beijernick, Winogradsky, Antony Van Leeuwenhoek, Louis Pasteur, Robert Koch, Ivanowski, Edward Jenner. Diversity of microbial world- concepts of Whittaker and Carl Woese, Differences between Prokaryotes and Eukaryotes.

MODULE II - GENERAL CHARACTERS AND SYSTEMATICS: (12Hrs)

Principles of bacterial taxonomy & classification, Numerical taxonomy, Outlines of bacterial classification (as per Bergey's manual of systematic bacteriology).
General characters and classification of the following groups: Eubacteria, Archaebacteria, Mycoplasma, Rickettsia and Chlamydia.

MODULE III - BACTERIAL CELL STRUCTURE AND MICROSCOPY: (16 Hrs)

Bacterial Cell size, shape and arrangement, glycocalyx, capsule, flagella, fimbriae and pili. Cell-wall: Composition and detailed structure of Gram-positive and Gram-negative cell walls, Archaebacterial cell wall, sphaeroplasts, protoplasts, and L-forms, Cytoplasm: ribosomes, mesosomes, inclusion bodies, nucleoid, and plasmids.
Bright field Microscope, Dark field Microscope, Phase contrast Microscope, Fluoresence Microscope, Scanning and Transmission Electron Microscope, Introduction to Confocal Microscope.

MODULE IV- CULTURE MEDIA AND STERILIZATION : (17 Hrs)

Culture media: Components of media, natural and synthetic media, chemically defined media, complex media, selective, differential, enriched, enrichment media and transport media. General methods of sterilization & disinfection: Physical methods-moist heat, boiling, autoclaving, pasteurization and tyndallisation. Dry heat – Hot air oven, incineration, inflammation, sunlight, filteration methods. Chemical methods: Phenol and phenolic alcoholic compounds, halogen, heavy metals and their compounds, dyes. Pure culture isolation: Streaking, serial and plating methods, cultivation, Maintenance and preservation/stocking of pure cultures; cultivation of anaerobic bacteria.

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5. Resources:

Text books:

1. Joanne M. willey, Linda M Sherwood, Christopher J Wooolverton (2011).
2. Prescott's Microbiology.8th edition, McGrawHill,publishers.
3. Black JG. (1999),Principles and Explorations- 4th edition. Microbiology Prentice Hall.
4. S. SundaraRajan (2003),Text Book of Microbiology – 1st edition,Vardana publishers.
5. R.P Singh (2005),General Microbiology - 1st edition, Kalyani publishers.

Reference Books:

1. Madigan MT and Martinko JM. (2014). Brock Biology of Micro-organisms. 14th edition. Parker J. Prentice Hall International, Inc.
2. Pelczar Jr MJ, Chan ECS, and Krieg NR. (2004). Microbiology. 5th edition Tata McGraw Hill.
3. Stanier RY, Ingraham JL, Wheelis ML and Painter PR. (2005). General Microbiology. 5th edition McMillan.
4. Tortora GJ, Funke BR, and Case CL. (2008). Microbiology: An Introduction. 9th edition Pearson Education.
5. Cappucino J and Sherman N. (2010). Microbiology: A Laboratory Manual. 9th edition. Pearson Education Limited.
6. Gopal Reddy *et al., (*2006), Laboratory experiments in Microbiology, 2nd Edition, Himalaya publishers.
7. Prescott, Harley and Klein Wim (2002), Laboratory Exercises in Microbiology, 5th edition,Mc Graw Hill Publishers.
8. R.C Dubey, D.K Maheshwari (2006), Practical Microbiology, S Chand and Company, New Delhi.

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Online Resources:

1. https://www.cliffsnotes.com/study-guides/biology/microbiology/introduction-to-microbiology/a-brief-history-of-microbiology

2.https://bio.libretexts.org/Bookshelves/Microbiology/Microbiology_(Boundless)/01%3A_Introduction_to_Microbiology

3.https://www.biologydiscussion.com/microbial-taxonomy/notes-on-microbial-taxonomy-major-characteristics-and-principles/86773

4.https://openstax.org/books/microbiology/pages/1-2-a-systematic-approach

5.https://www.onlinebiologynotes.com/bacterial-cell-structure

6.https://www.biosciencenotes.com/sterilization-of-culture-media/

7.https://microbenotes.com/types-of-culture-media

6. Syllabus Focus:

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

Local/Regional/National /Global Development Needs	**Relevance**
Local needs	Sterilization techniques are valuable tools used by Bacteriologist, epidemiologists, doctors, forensic scientists, farmers etc
Global Development Needs	It holds Global need to apply Sterilization techniques which destroys or eliminates pathogenic microbial life and is carried out in health-care facilities by physical or chemical methods.

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b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
SD	Module IV	Students will be provided with the opportunity to prepare different types of media by aseptic means and hands on training in operating various instruments in the lab.

7.Pedagogy:

S. No	Type / Description of Activity	Student Centric Methods Adopted
1.	Interactive class session	Participative Learning
2.	Quiz	Experiential Learning
3.	Group Discussion	Participative Learning

8. Course Assessment Plan:

a) 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 Presentation, Quiz	
CO4	CIA-2 Assignment	

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b) Question Paper Pattern:

BACTERIOLOGY AND SYSTEMATICS
MODEL QUESTION PAPER-THEORY

Course Code: U24/MIC/DSC/101 **Max Marks: 60**
Credits: 4 **Time: 2 Hrs**

SECTION –A

I. Answer the following **4x10=40 M**

1. Describe the significance of microbiology in healthcare, including the diagnosis, treatment, and prevention of infectious diseases. Provide examples of how microbiologists contribute to the development of vaccines, antibiotics, and diagnostic tests.

(OR)

2. Illustrate the contributions of Louis Pasteur and Robert Koch.

3. Explain general characters of Rickettsia and its classification.

(OR)

4. How would you summarize the Ecological and Morphological identification of bacteria ?

5. Organize the detail structure of Gram positive and Gram negative bacterial cell wall.

(OR)

6. How would you apply the principle and working mechanism of TEM microscopy you had learnt?

7. How can you make a distinction between differential media, selective media and transport media ?

(OR)

8. Distinguish between Physical and chemical methods of sterilization.

SECTION –B

II. Answer any FOUR **4x5=20 M**

9. Explain five kingdom classification
10. Outline the contribution of Louis pasteur
11. What is Numerical Taxonomy
12. Describe Archaebacteria cell wall
13. How would you identify bacteria under Dark field microscope
14. List out Phenol and phenolic compounds

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SECTION A - INTERNAL CHOICE				4Q X 10 M = 40 M
Question Number	**Module**	**Question**	**CO**	**BTL (Blooms Taxonomy Level)**
1	Module 1	Describe the significance of microbiology in healthcare, including the diagnosis, treatment, and prevention of infectious diseases. Provide examples of how microbiologists contribute to the development of vaccines, antibiotics, and diagnostic tests.	CO 1	Level II
2	Module 1	Illustrate the contributions of Louis Pasteur and Robert Koch	CO 1	Level II
3	Module 2	Explain general characters of Rickettsia and its classification	CO 2	Level II
4	Module 2	How would you summarize the Ecological and Morphological identification of bacteria	CO 2	Level II
5	Module 3	Organize the detail structure of Gram positive and Gram negative bacterial cell wall	CO 3	Level III
6	Module 3	How would you apply the principle and working mechanism of TEM microscopy you had learnt.	CO 3	Level III
7	Module 4	How can you make a distinction between differential media, selective media and transport media	CO 4	Level IV
8	Module 4	Distinguish between Physical methods of sterilization.	CO 4	Level IV
SECTION B - ANSWER ANY 4 OUT OF 6 (To compulsorily have **ONE** question from **each** module)				4 Q X 5M = 20M
9	Module 1	Explain five kingdom classification	CO 1	Level II
10	Module 1	Outline the contribution of Louis pasteur	CO 1	Level II
11	Module 2	What is Numerical Taxonomy	CO 2	Level II
12	Module 2	Describe Archaebacteria cell wall	CO 2	Level II
13	Module 3	How would you identify bacteria under Dark field microscope	CO 3	Level III
14	Module 4	List out Phenol and phenolic compounds	CO 4	Level IV

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SEMESTER I
BACTERIOLOGY & SYSTEMATICS – PRACTICAL

1. Course Description:

Course Code: U24/MIC/DSC/101/P **Max. Hours: 30**

Course Type: DSC **Hours per week: 2**

No. of credits: 1 **Max. Marks: 50**

2. Course Objectives:

- To make students to understand as how to use different instruments in microbiology lab and to demonstrate basic laboratory skills and techniques related to the cultivation, isolation, staining, and identification of microorganisms.

3.Course Outcomes:

CO 1: Understand importance of different medias to isolate and identify bacteria.

CO 2: Evaluate different cultivation and staining technique to detect microbes.

List of Practicals

1. Preparation of different media: -Nutrient agar, Czapek Dox agar, Potato Dextrose Agar Media
2. Simple staining
3. Negative staining
4. Gram's staining
5. Acid fast staining-permanent slide only
6. Capsule staining
7. Endospore staining
8. Isolation of pure cultures of bacteria by streaking, spread plate and pour plate techniques
9. Isolation of soil bacteria by dilution plate technique
10. Isolation of bacteria from air by impingement method.
11. Motility by hanging drop method

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MODEL QUESTION PAPER – PRACTICAL

Course Code: U24/MIC/DSC/101/P **Max Marks: 50**
Credits: 1 **Time: 2 Hrs**

I. MAJOR **20M**

1. Perform Gram staining and interpret the results with neat labeled diagrams.

II. MINOR **10 M**

2. Demonstrate the pure culture isolation technique by performing spread plate method.

(OR)

3. Calculate the CFU of the given plates.

III. Identify the given spots (A-E) and write few significant points **5x2=10 M**

IV. Record **5M**

V. Viva **5M**

Prepared by Faculty	Checked &Verified by HoD	Approved by the Principal
Dr. Arsheen Tabassum	Dr. P. Roselin	Dr. Uma Joseph

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SEMESTER – I

BASIC COMPUTER SKILLS

1. Course Description:

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

Course Code: U24/BCS/AECC/101

Type of course: AECC

No. of credits: 2

Max. Hours: 30

Hours per week: 2

Max. Marks: 50

2. Course Objectives:

To impart a basic level understanding of working of a computer and its usage.

3. Course Outcome:

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

CO1: ***Interpret*** basics of computers and ***Use*** word processing software (Cognitive levels – 3)

CO2: ***Define*** Internet Technologies and ***Use*** Spreadsheets and Presentation Software (Cognitive level – 3)

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4. Course Content:

MODULE I: BASICS OF COMPUTERS AND WORD PROCESSING (15 Hrs)

Understanding Of Computer: Introduction to computers - functions, features, classification; Computer Architecture - components; Computer Hardware - input devices, output devices; Computer Memory -primary memory, secondary memory, cloud; Computer Software - system software, application software, special purpose software, system utilities, open-source software, and proprietary software; Operating Systems - functions, types, real time operating systems,

Windows Ui And Word Processing: Windows desktop – icons, task bar, start menu, understanding of local system drives, folders and files – creating, viewing, renaming, deleting; MS-Word - opening , closing, saving of documents, title bar, ribbon and tabs, ruler; text creation and manipulation – insert, delete, select, cut, copy and paste, find and replace, correct errors - spell; formatting text – font size, size, colour, bold, underline, italic, changing text case, text alignment; creating first line indent of paragraphs; formatting page – inserting header and footer, page breaks; modifying page layout - changing page orientation , page size, page margins; tables – inserting, adding and deleting rows and columns, converting text to table, working with lists, using symbols as bullets, printing documents

MODULE II: INTRODUCTION TO INTERNET TECHNOLOGY, SPREADSHEETS AND PRESENTATION SOFTWARE (15Hrs)

Overview of Internet and Future Technology: Internet – advantages and disadvantages of internet; Terms related to internet – WWW, web page, website, web browser, web address and URL, blog, search engine; Services of Internet – chatting, e-mail, video- conferencing, e-learning, e-banking, e-shopping, e-reservation; Social networking sites – LinkedIn, Facebook, Instagram; Computer Security – sources of cyber-attack, malware, threats to computer security, solutions to computer security threats; Future Technology – Internet of Things(IoT), Big Data Analytics, Virtual Reality, Artificial Intelligence,

Spreadsheet and Presentation Software: Spreadsheets - Workbook, worksheet, MS Excel vs Google sheets; basics of spreadsheet – enter, select, delete, move, copy and paste data, fill numbers, text, date; adding borders to cells, functions – count, sum, average; formulas – simple, relative reference, absolute reference, printing worksheet; Presentation – introduction to slide, placeholder, notes, adding slides, changing layouts of slides, applying styles and background, adding text box and pictures, adding animations, setting slide transitions, saving single slide as image, saving presentation in different formats (ppt, pdf, video)

5. References:

1. Microsoft Office Step by Step (Office 2021 and Microsoft 365), Joan Lambert, 1st edition, 2022
2. Computer Basics with Office Automation, Archana Kumar, Wiley publications,2019
3. Introduction to Computers, Peter Norton, McGraw-Hill ,2012.
4. Fundamentals of Computers, Reema Thareja,2nd Edition 2019.

6. Syllabus Focus

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

Local /Regional/National /Global Development Needs	Relevance
GLOBAL DEVELOPMENT	Basic computer skills such as word processing, spreadsheets, presentations, and the internet, are essential for most jobs and are considered valuable skills in the workforce. Good computer skill aligns with an individual's career goals and enhances productivity and effectiveness in the workplace.

b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
SD, EMP	Module 1	Assignment
SD, EMP	Module 2	Skill practical test

7. Course Assessment Plan

a) Weightage of Marks in Formative and Summative Assessments

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

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b) Model Question Paper - End Semester Exam

BASIC COMPUTER SKILLS

Course Code: U24/BCS/AEEC/101 **Max Time: 1 Hr**
Credits: 2 **Max. Marks: 30**

Answer any 5 of the following: **5 X 6 = 30 M**

1. Explain Computer Architecture.
2. Differentiate between Primary and Secondary Memory.
3. Explain functions of an Operating System.
4. Define types of Software.
5. Write a short note on the Internet.
6. List and explain the services of the Internet.
7. Explain with example the concept of IoT.
8. Explain various threats to computer systems.

Prepared by	Checked & verified by	Approved by
Ms. Prabhmeet **Teaching Faculty**	**Ms. D. Sowjenya** **HOD**	**Dr. Uma Joseph** **Principal**

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SEMESTER-1

BIOMOLECULES

1. Course Description

Programme : B.Sc.
Course Code : U24/BIC/DSC/101
Type of course : DSC 1
No. of credits : 4

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

2. Course Objectives

- To understand the basic molecules of life about the structures, properties, functions and classification.
- To elucidate the importance of knowledge on the biochemical aspects of the biomolecules in biological systems.

3. Course Outcomes

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

CO1: Recall in detail the structure, physico-chemical properties and significance of carbohydrates from monosaccharide to polysaccharides(L1)

CO2: Summarise the structures of amino acids, reactions of amino acids, protein classification, different levels of organization of proteins(L2)

CO 3: Illustrate the structure and function of lipids, fatty acids and lipoproteins(L3)

CO 4: Use knowledge on nucleic acids, different forms and denaturation of DNA and types of RNA(L3).

4. Course Content –

Module I: CARBOHYDRATES **(15 hrs)**

Carbohydrates: Classification, Monosaccharides, D & L designation, open chain & cyclic structures, Stereochemistry of monosaccharaides – optical isomers, mutarotation, Reactions of carbohydrates Disaccharides – structure of maltose, sucrose, lactose. Classification of Polysaccharides Homopolysaccharides-Starch, glycogen, Cellulose, Heteropolysaccharides – Hyaluronic acid, chondroitin sulphate, Heparin. Structure, occurrence, biological importance of Bacterial cell wall polysaccharides.

Module II: PROTEINS **(15 hrs)**

Amino acids & Peptides, Amino acid classification, Structure & Stereochemistry, Optical Isomerism of Amino Acid. Reactions of amino acids. Essential & Non – essential amino acid, Non – Protein amino acid, Peptide bond. Nature & conformation.

Proteins: Classification based on solubility, structure, function & composition of proteins. Biological role of proteins. Structural organization of proteins - Primary, Secondary, Tertiary& Quaternary Structures Denaturation of protein structure. Determination of amino acid composition of protein

Module III: LIPIDS **(15 hrs)**

Classification, distribution, and general properties, Structure and biological importance of lipids - simple lipids, compound lipids and derived lipids. Fatty acids –classification, structure, nomenclature, physical and chemical properties. Saturated and Unsaturated fatty acids; Essential fatty acids and non-essential fatty acids, Saponification value, Iodine number, Acid value, Rancidity of oils and fats. General properties and structures of phospholipids, sphingolipids and cholesterol.

Lipoproteins – Types and functions.

Module IV: NUCLEIC ACIDS **(15 hrs)**

Nature of Nucleic acids. Structure of purines, pyrimidines, nucleosides, nucleotides. DNA, RNA. Stability and formation of phosphodiester linkage. Effect of acids, alkali and nucleases on DNA and RNA. Watson – Crick double helix structure.

Different forms of DNA – A, B, Z. Introduction to Circular DNA, Supercoiling, denaturation of DNA – hyperchromic effect, T_m values and their significance. Cot curves and their significance. Packaging of DNA. Different types of RNA.

5. Reference Books

1. Dr. U.Satyanarayana and U.Chakrapani Biochemistry 5th ed. (2001) Elsevier (New Delhi), Books and Allied Private Limited. ISBN: 81-87134-80-1
2. J.L.Jain : Fundamentals of Biochemistry, (2001), S. Chand & Company (New Delhi)
3. Albert L. Lehninger: Principles of Biochemistry (2013) 6th ed. Nelson, D.L. and Cox, M.M.W.H. Freeman and Company (New York)
4. Jeremy M Berg, John L Tymoczko, and LubertStryer Biochemistry, 5thedW H Freeman; (2002) ISBN-10: 0-7167-3051-0
5. Dr. A.C Deb: Fundamentals of Biochemistry, (1999), New Central Book Agency Private Limited. ISBN : 81-7381-144-X

6. Syllabus Focus

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

Local /Regional/National /Global Development Needs	Relevance
Global Development needs	Understanding biomolecules have far-reaching implications, addressing global challenges and contributing to advancements in science across the world.

b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
SD	Reactions of amino acids	Practicals- Qualitative analysis
SD	Denaturation of protein structure. Determination of amino acid composition of protein	Explanation of the techniques used for protein sequencing
SD	Saponification value, Iodine number, Acid value, Rancidity of oils and fats.	Practicals

7. Pedagogy

S. No	Type/Description of Activity	Student Centric Methods Adopted
1.	Science Experiments	Experiential Learning
2.	Presentation/Assignment	Participative 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 (40%)	End Semester Examination (60%)
CO1	CIA-1	End Semester examination
CO2	CIA-1	
C03	CIA-2 – Objective	
C04	CIA-2 – Assignment/ model making/ PPT	

b) Model Question Paper

BIOMOLECULES

Code : U24/BIC/DSC/101
Credits : 4

Max Marks : 60 M
Time : 2 Hrs

I. Answer the following questions **(4x10=40M)**

1. (a) Define carbohydrates. Give their classification with suitable examples indicating their structures.

   OR

   (b) List the reactions of monosaccharides.

2. (a) Explain the forces that stabilize the tertiary & quaternary structure of proteins.

   OR

   (b) Describe the determination of N & C terminal amino acid of a peptide?

3. (a) Illustrate the structural features & functions of phospholipids.

   OR

   (b) Categorize the reactions of fatty acids & add a note on their biological importance.

4. (a) Demonstrate Watson & Crick model of DNA double helix.

   OR

   (b) Illustrate the three levels of chromatin organization in a eukaryotic cell.

II. Write Short notes on any 4 questions (out of 6) **(4x5=20M)**

5. Mutarotation
6. Denaturation of proteins
7. Essential amino acids
8. Iodine number
9. Cot curve
10. Super coiling of DNA

CBCS-2024

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

Semester I-Biomolecules

SECTION A - INTERNAL CHOICE (4 X 10 M = 40 M)				
Q.No.	**Question**	**Question**	**CO**	**BTL (Blooms Taxonomy Level)**
1	Module 1	Define carbohydrates. Give their classification with suitable examples indicating their structures.	CO 1	1
2	Module 1	List the reactions of monosaccharides.	CO 1	1
3	Module 2	Explain the forces that stabilize the tertiary & quaternary structure of proteins?	CO 2	2
4	Module 2	Describe the determination of N & C terminal amino acid of a peptide?	CO 2	2
5	Module 3	Illustrate the structural features & functions of phospholipids.	CO 3	3
6	Module 3	Categorize the reactions of fatty acids & add a note on their biological importance.	CO 3	4
7	Module 4	Demonstrate Watson & Crick model of DNA double helix.	CO 4	3
8	Module 4	Illustrate the three levels of chromatin organization in a eukaryotic cell.	CO 4	3
SECTION B - ANSWER ANY 4 OUT OF 6 (4Q X 5M = 20M) (To compulsorily have **ONE** question from **each** module)				
10	Module 1	Mutarotation	CO 1	1
11	Module 2	Denaturation of proteins	CO 2	2
12	Module 3	Essential amino acids	CO 3	3
13	Module 4	Iodine number	CO 4	3
14	Any Module	Cot curve	CO 4	3
15	Any Module	Super coiling of DNA	CO 4	3

BIOMOLECULES
PRACTICAL

1. Course Description:

Max. Hours: 30
Course Code: U24/BIC/DSC/101/P
Type of course: DSC 1

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

2. Course objective:

Introduce the basic molecules of life with respect to their isolations and qualitative estimations.

3. Course Outcome:

This course will help the students to-

CO1: Demonstrate the procedures to isolate biomolecules from food sources.

CO2: Apply the skills in qualitative identification of Sugars and lipids by following a series of tests and procedures

PRACTICAL SESSIONS

1. Isolation of starch from potato.
2. Isolation of casein from milk.
3. Qualitative Analysis of Carbohydrates. (4 sessions)
4. Qualitative Analysis of Lipids. (3 sessions)
5. Preparation of buffers & determination of pH.
6. Achromic Point
7. Determination of specific rotation of sugars (Glucose & Fructose)

MODEL QUESTION PAPER
PRACTICAL

Course Code: U24/BIC/DSC/101/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. Carbohydrates
   b. Principle involved in the isolation of casein from milk. (10 M)
2. Identify the given sugars present in the given solutions **A** and **B** (10 + 10 M)
3. Extract casein from the given sample of milk (10 M)
4. Viva (5M)
5. Record (5M)

Prepared by Course Teacher [Name & Signature]	Checked &verified by HOD [Name & Signature]	Approved by the Principal
Dr. G. Sony	(S. Malathi Varma) HOD Biochemistry St. Francis College for Women Begumpet, Hyderabad-16.	

Professor Karuna Rupula
Department of Biochemistry
University College of Science
Osmania University
Hyderabad-500 007 (TS)

SEMESTER - I

CHEMISTRY PAPER - I

1. Course Description

Programme: B.Sc. Max. Hours: 60Hrs

Course Code: U24/CHE/DSC/101 Max. Marks: 100

Course Type: DSC - 1 Hours per week: 4Hrs

No. of credits: 4

2. Course Objectives ·

- To help the students acquire knowledge on the basic principles of Quantum mechanics and chemical bonding
- To understand the nature and properties of different states of matter. • · To learn the structures of basic organic molecules, the types of reactions they undergo and methods of preparation and reactivity of hydrocarbons with mechanisms • · To foster acquisition of knowledge on the concepts of colligative properties and Quantitative analysis

3. Course Outcomes

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

CO1: Understand and explain the structure of an atom using quantum mechanics and Chemical bonding

CO2: Understand the properties of gases, liquid crystals and crystalline solids.

CO3: Acquire a fundamental understanding of the relationships between molecular structure and reaction mechanisms. Interpret and familiarize with the various types of aliphatic reactions.

CO4: Apply knowledge in quantitative analysis and study about Colligative properties

Chairperson
Board of Studies in Chemistry
Dept of Chemistry
Osmania University, Hyd-07.

4. Course Content

Module I: INORGANIC CHEMISTRY — 15 Hrs

Atomic Structure and Elementary Quantum Mechanics — **8 Hrs**

Limitations of Classical Mechanics, Black body radiation, Rayleigh Jeans Law, Planck's radiation law, photoelectric effect, Compton effects, De Broglie's hypothesis, Heisenberg's uncertainty principle, sinusoidal wave equation, Hamiltonian operator, Schrodinger equation in Cartesian and spherical polar coordinates (no derivation) Physical significance of terms involved, equation applied to H-atom. Atomic Orbitals, Radial and angular wave functions, Shape of atomic orbitals (Quantitative treatment) based on angular wave functions). Probability distribution curves - Quantum numbers and their importance.

Chemical bonding **7Hrs**

Ionic solids- lattice and solvation energy, solubility of ionic solids, Fajan's rule, Polarity and polarizability of ions, covalent nature of ionic bonds. Covalent bond- VB theory and common hybridization and shapes of molecules.

Molecular orbital theory- shapes and sign convention of atomic orbital, modes of overlapping, concepts of sigma and pi bonds, criteria forming molecular orbital from atomic orbital. LCAO concept. Types of molecular orbitals, bonding and anti-bonding and non-bonding. MOED of homonuclear - H_2, N_2, O_2, O_2^-,O_2^{2-}, F_2, (unhybridized diagram only) and heteronuclear diatomic molecules CO, CN^-, NO, $NO^+$and HF. Bond order, stability and magnetic properties.

Module II: PHYSICAL CHEMISTRY — 15 Hrs

States of Matter

Gaseous State — **7 Hrs**

Deviation of real gases from ideal behavior, Vander Waal's equation of state. Critical phenomena: PV-isotherms of real gases, continuity of state, Andrew's isotherms of carbon dioxide. The Vander Waals equation and the critical state, Derivation of relationship between critical constant and Vander Waals constants. Experimental determination of critical constants. The law of corresponding states, reduced equation of state. Joule -Thomson effect and inversion temperature of a gas. Liquefaction of gases: (i) Linde's method based on Joule Thomson effect. (ii) Claude's method based on adiabatic expansion of a gas.

Liquid State — **3 Hrs**

Inter molecular forces, structure of liquids (qualitative description). Structural differences between solids, liquids and gases. Liquid crystals, the mesomorphic state: Classification of liquid crystals into Smectic and Nematic, differences between liquid crystal and solid/liquid. Application of liquid crystals as LCD devices.

Solid State — **5 Hrs**

Laws of crystallography (i) Law of Constancy of interfacial angles (ii) law of symmetry, symmetry elements in crystals. (iii) Law of rationality of indices. Definition of space lattice, unit cell. Bravais lattices and seven crystals systems. X-ray diffraction of crystals: Deviation of

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Bragg's equation, determination of structure of NaCl (Bragg's method and powder method).

Defects in crystals: Stoichiometric and non-Stoichiometric defects. Band theory of semiconductors: Extrinsic and Intrinsic Semiconductors, n-type and p-type and their applications in photo voltaic cells.

MODULE III ORGANIC CHEMISTRY 15 Hrs

Structural Theory of Organic Molecules 7 Hrs

Cleavage of bonds (homolysis and heterolysis), Electrophiles, Nucleophiles (including neutral molecules like H_2O, BF_3, NH_3 and $AlCl_3$). Reactive intermediates: carbocations, carbanions and free radicals.

Electronic Displacements

Inductive effect. Application of inductive effect to a) Basicity of amines b) Acidity of Carboxylic acids and c) Stability of carbocations. Resonance or Mesomeric effect. Application to a) Acidity of phenol and (b) acidity of carboxylic acids .Hyper-conjugation and its application to stability of carbocations, Free radicals and alkenes.

Types of organic reactions (mechanism not required)

Addition – Electrophilic, nucleophilic and free radical. Substitution – Electrophilic, Nucleophilic and Free radical. Elimination and Rearrangement Reactions – examples.

Aliphatic Hydrocarbons 8Hrs

Aliphatic Hydrocarbons

Alkanes – Methods of preparation: Corey-House reaction, Wurtz reaction, from Grignard reagent, Kolbe synthesis. Chemical reactivity - inert nature, free radical substitution, Halogenation example- reactivity, selectivity and orientation.

Alkenes – Preparation of alkenes (with mechanism) (a) by dehydration of alcohols (b) dehydro-halogenation of alkyl halides (c) by dehalogenation of 1,2 dihalides, Zaitsev's rule. Properties: Addition of Hydrogen – heat of hydrogenation and stability of alkenes. trans addition of halogen and its mechanism. Addition of HX, Markonikov's rule, addition of H_2O, HOX, H_2SO_4 with mechanism and addition of HBr in the presence of peroxide (anti – Markonikov's addition). Oxidation (cis – additions) – hydroxylation by $KMnO_4$, OsO_4, trans addition- peracids (via epoxidation), hydroboration, ozonolysis – location of double bond. Dienes – Types of dienes, reactions of conjugated dienes – 1,2 and 1,4 addition of HBr to 1,3 -butadiene and Diels – Alder reaction.

Alkynes – Preparation by dehydrohalogenation of vicinal dihalides, dehalogenation of tetrahalides. Physical Properties: Acidity of terminal alkynes (formation of metal acetylides) preparation of higher alkynes, Chemical reactivity – electrophilic addition of X_2, HX, H_2O (tautomerism), Oxidation (formation of enediol, 1,2 diones and carboxylic acids) and reduction (Metal-ammonia reduction, catalytic hydrogenation).

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MODULE IV: GENERAL CHEMISTRY — 15 Hrs

Theory of Quantitative Analysis — 7Hrs

Principles of volumetric analysis: Introduction, standard solution, indicators, endpoint, titration error. Types of titrations: i) Neutralization titrations- principle, titration curves and selection of indicators- strong acid-strong base, strong-acid- weak base, weak acid-strong base, weak acid-weak base. ii) Redox titrations-principles, detection of endpoint, redox indicators. iii) Precipitation titrations-principle, detection of endpoint, indicators. iv) Complexation titrations-principle, metal ion indicators.

Principles of gravimetric analysis – Introduction, nucleation, precipitation, growth of precipitate, filtration and washing, drying and incineration of precipitate. Co-precipitation and post-precipitation. Explanation with suitable examples.

Evaluation of analytical data — 3 Hrs

Significant figures, accuracy and precision. Errors-classification of errors- determinate and indeterminate errors, absolute and relative errors, propagation of errors in mathematical operations – addition, subtraction, division and multiplication (with respect to determinate errors).

Colligative Properties — 5 Hrs

Colligative Properties, Raoult's law, relative lowering of vapour pressure, molecular weight determination. Osmosis - laws of osmotic pressure, its measurement, determination of molecular weight from osmotic pressure. Elevation of boiling point and depression of freezing point. Derivation of relation between molecular weight and elevation in boiling point and depression in freezing point.

5. References

1. Puri, B.R., Sharma L.R., and Pathania, M.S. (2003). *Elements of Physical Chemistry.* Jalandhar, Delhi: Vishal Publishing Co.
2. Bahl, A., &Tuli. (2009). *Essentials of physical chemistry: A textbook for B. Sc. classes as per UGC model syllabus* (Rev. multicolored.). New Delhi: S. Chand.
3. Bahl, A. and Bahl, B.S. (2011). *A Textbook of Organic Chemistry.* Ram Nagar, New Delhi: S. Chand and Company.
4. Jain, M.K., and Sharma, S.C. (2011). *Modern Organic Chemistry.* Jalandhar, Delhi: Vishal Publishing Co.
5. Sharma, Y. R. (2012). *A TextBook of Complete Organic Chemistry*. Bangalore: Kalyani Publishers.
6. Principles of Inorganic Chemistry by Puri, Sharma and Kalia. Vishal Publications 1996.
7. Concise Inorganic Chemistry by J.D. Lee 3rd edn.

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CHEMISTRY PAPER-I

MODEL QUESTION PAPER

THEORY

Course Code: U24/CHE/DSC/101 **Time: 2hrs**

Credits: 4 **Max. Marks: 60**

SECTION –A

I. Answer the following **4QX10M=40 Marks**

1. Write the Schrodinger wave equation and explain the significance of ψ and ψ^2 and draw shapes of p and d atomic orbitals 10M **L1**

OR

2. Write postulates of MOT. Explain MOED of O2. 8M **L1**

3. Explain Critical phenomenon and derive relationship between Van der Waals constants and critical constant. 10M **L2**

OR

4. Explain (a) Frenkel defect (b) Schottky defect (c) Metal excess defect (d) Metal deficiency defect 10M **L2**

5. a) What is the Mesomeric effect? How does it explain the acidity of phenols? 5M **L1**

b) Give the order of basicity of the following amines by applying the concept of Inductive effect CH_3NH_2, $(CH_3)_2NH$, $(CH_3)_3N$ 5M **L1**

OR

6. a) Explain Acidity of terminal Alkynes 5M **L2**

b) Write any two methods of preparation of Alkanes. 5M **L1**

7. Explain the principle involved in redox titration? Write a short note on detection of endpoints. 10M **L2**

OR

8. What is molal depression constant? Derive the relation between depression of freezing point and molecular weight of the solute. 10M **L1**

SECTION –B

II. Answer any Four 4Qx5M=20 Marks

9. State and explain Heisenberg's uncertainty principle. Calculate the uncertainty in the position of a particle when the uncertainty in the momentum is 0.01 gm.cm/ sec. (h= 6.625x 10^{-27} erg.sec). 5M(CO1) **L3**

10. Differentiate between Smectic, Nematic liquid crystals and give their application. 5M (CO2)**L3**

11. What are dienes? Explain 1,2- and 1,4- addition of HBr on 1,3-Butadiene. 5M (CO 3)

12. Define the term accuracy and precision with examples. 5M (CO 4) **L1**

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13. Explain Andrew Isotherm of CO_2 at different temperatures 5M (CO 2) **L2**
14.. Explain Markonikoff's rule with examples. 5M (CO 3) **L2**

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 -I
QUANTITATIVE ANALYSIS 1
(Volumetric and Gravimetric Analysis)

Program: B.Sc.
Course Code: U24/CHE/DSC/101/ P
Course: DSC-1
No. of Credits: 1

Max. Hours: 30 Hrs
Max. Marks: 50
Hours per week: 3 Hrs

Course Objective

- To learn the principles involved in volumetry and gravimetry

Course Outcome

CO 1: Acquire knowledge in standardizing and estimating unknown samples quantitatively.

CO 2: Analyse possible market samples based on the principles involved in volumetry and compare with standards.

Volumetric Analysis

1. Estimation of sodium carbonate.
2. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture.
3. Estimation of oxalic acid by titrating it with $KMnO_4$.
4. Estimation of water of crystallization in Mohr's salt by titrating with $KMnO_4$.
5. Estimation of carbonate in washing soda.
6. Estimation of Acetic Acid in Vinegar.
7. Estimation of alkali content in antacids using HCl.

Gravimetric Analysis:

8. Estimation of chromate as lead chromate.

References:

1. Svehla, G. Vogel's Qualitative Inorganic Analysis, Pearson Education, 2012.
2. Mendham, J. Vogel's Quantitative Chemical Analysis, Pearson, 2009.

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6. Syllabus Focus

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

Local/Regional/National /Global Development Needs	Relevance
Local	Knowledge of the basic principles of Chemistry to help in day-to-day life.
Regional	Learn about the concepts of structure of atoms and their bonding.
National	Understand the basics of structure of organic molecules, preparation and reactivity of aliphatic and aromatic hydrocarbons.
Global	Application of quantitative Analysis, evaluation of analytical data and Colligative Properties.

b. Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
SD	Module I	Deriving equations, solving theoretical problems and interpreting results.
ED	Module II	JAM: Students pick up a topic and speak about it for a minute.
SD	Module III	Assignment/Mechanism: Students write an assignment/Illustrate the steps involved in the mechanism of reactions.
EMP	Module IV	Quantitative analysis is used extensively in Analytical research laboratories

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7. **Pedagogy**

S. No.	Student Centric Methods Adopted	Type / Description of Activity
1	Participative Learning	Assignment
2	Participative Learning	Collage/ Quiz/ JAM

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 Collage/Quiz/JAM**	
CO3	**CIA-1 -** Written Exam	
CO4	**CIA-2 Assignment**	

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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
MODEL PAPER
B.SC. I YEAR SEMESTER -I

Course Code: U24/CHE/DSC/101 **Time: 2 Hrs**
Credits: 4 **Max. Marks: 60**

SECTION –A (Essay Questions)

I. Answer the following **4X10M=40 Marks**

1. Write the Schrodinger wave equation and explain the significance of ψ and ψ^2 and draw shapes of p and d atomic orbitals. (CO1) **LI** 10M

OR

2. Write postulates of MOT. Explain MOED of O2. (CO1) **L1** 8M
3. Explain Critical phenomenon and derive relationship between Van der Waals constants and critical constant. (CO2) **L2** 10M

OR

4. Explain (a) Frenkel defect (b) Schottky defect (c) Metal excess defect (d) Metal deficiency defect. (CO2) **L2** 10M
5. a) What is the Mesomeric effect? How does it explain the acidity of phenols? (CO3) **L1** 5M
   b) Give the order of basicity of the following amines by applying the concept of Inductive effect CH_3NH_2, $(CH_3)_2NH$, $(CH_3)_3N$ (CO3) **L1** 5M

OR

6. Write the mechanism for Friedel Crafts alkylation and acylation of benzene. (CO3) **L1** 10M

7. Explain the principle involved in redox titration? Write a short note on detection of endpoints. (CO4) **L2** 10M

OR

8. What is molal depression constant? Derive the relation between depression of freezing point and molecular weight of the solute. (CO4) **L1** 10M

SECTION –B (Short Answer Questions)

II. Answer any Four **4x5=20 Marks**

9. State and explain Heisenberg's uncertainty principle. Calculate the uncertainty in the position of a particle when the uncertainty in the momentum is 0.01 gm.cm/ sec. ($h = 6.625 \times 10^{-27}$ erg. sec). (CO1) **L3**
10. Differentiate between Smectic, Nematic liquid crystals and give their application. (CO2) **L3**
11. What are dienes? Explain 1,2- and 1,4- addition of HBr on 1,3-Butadiene. (CO 3) **L1**
12. Define the term accuracy and precision with examples. (CO 4) **L1**
13. Explain Andrew Isotherm of CO_2 at different temperatures. (CO 2) **L2**
14. Explain Markonikoff's rule with examples. (CO 3) **L2**

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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	1	5
2	15	CO2	2	10	2	10
3	15	CO3	2	10	2	10
4	15	CO4	2	10	1	5

9. CO-PO Mapping

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

Prepared by	Checked & verified by	Approved by
Name and Signature of the teaching faculty Ms. Karuna. K.S Dr. E.V.L. Madhuri	Name and Signature of the HoD Dr. D. Sumalatha	Name and Signature of Principal Dr. Uma Joseph

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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.Sc. I YEAR SEMESTER -I

Time: 2 Hrs **Course Code: U24/CHE/DSC/101**
Max. Marks: 60 **Credits: 4**

SECTION A - INTERNAL CHOICE			**4 X 10 M = 40M**	
Question Number	**Question**		**CO**	**BTL**
1	**Module 1**	Write the Schrodinger wave equation and explain the significance of ψ and ψ^2 and draw shapes of p and d atomic orbitals. 10M **OR**	**CO1**	**Level 1**
2	**Module 1**	Write postulates of MOT. Explain MOED of O2. 8M	**CO1**	**Level I**
3	**Module 2**	Explain Critical phenomenon and derive relationship between Van der Waals constants and critical constant. 10M **OR**	**CO2**	**Level 2**
4	**Module 2**	Explain (a) Frenkel defect (b) Schottky defect (c) Metal excess defect (d) Metal deficiency defect. 10M	**CO2**	**Level 2**
5	**Module 3**	a) What is the Mesomeric effect? How does it explain the acidity of phenols? 5M b) Give the order of basicity of the following amines by applying the concept of Inductive effect CH_3NH_2, $(CH_3)_2NH$, $(CH_3)_3N$ 5M **OR**	**CO3**	**Level 1**
6	**Module 3**	Write the mechanism for Friedel Crafts alkylation and acylation of benzene. 10M	**CO3**	**Level 1**
7	**Module 4**	Explain the principle involved in redox titration? Write a short note on detection of endpoints. 10M **OR**	**CO4**	**Level 2**

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8	**Module 4**	What is molal depression constant? Derive the relation between depression of freezing point and molecular weight of the solute. 10M	**CO4**	**Level 2**
SECTION B – (Short answer questions) **ANSWER ANY 4 OUT OF 6**				**4 X 5M = 20 M**
9	**Module 1**	State and explain Heisenberg's uncertainty principle. Calculate the uncertainty in the position of a particle when the uncertainty in the momentum is 0.01 gm.cm/ sec. (h= 6.625x 10^{-27} erg. sec).	**CO1**	**Level 3**
10	**Module 2**	Differentiate between Smectic, Nematic liquid crystals and give their application.	**CO2**	**Level 3**
11	**Module 3**	What are dienes? Explain 1,2- and 1,4-addition of HBr on 1,3-Butadiene.	**CO3**	**Level 1**
12	**Module 4**	Define the term accuracy and precision with examples. (CO 4) **L1**	**CO4**	**Level 1**
13	**Module 2**	Explain Andrew Isotherm of CO_2 at different temperatures. (CO 2) **L2**	**CO2**	**Level 2**
14	**Module 3**	Explain Markonikoff's rule with examples.	**CO3**	**Level 2**

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