

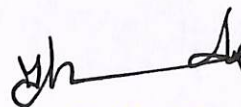
St. FRANCIS COLLEGE FOR WOMEN, BEGUMPET HYDERABAD-500016  
(An Autonomous College Affiliated to Osmania University)  
DEPARTMENT OF CHEMISTRY

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

B. Saritha

Head

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Professor

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

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

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

**2. Course Objectives**

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

**3. Course Outcomes**

On completion of the course the student will be able to

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

DEPARTMENT OF CHEMISTRY, ST. FRANCIS COLLEGE FOR WOMEN, HYDERABAD.

*D. Parvatha*  
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Professor  
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## 4. Course Content

**MODULE I: INORGANIC CHEMISTRY**

15 h (1h/week)

**Chemistry of d-block elements**

7h

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

**Chemistry of f-block elements**

8h

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

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

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

**MODULE II: ORGANIC CHEMISTRY**

15 h (1h/week)

**Halogen compounds**

4 h

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

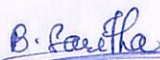
**Hydroxy compounds and ethers**

5 h

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

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

**Ethers:** Nomenclature, preparation by Williamson synthesis. Chemical properties – inert nature, action of conc. H<sub>2</sub>SO<sub>4</sub>.



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**Carbonyl compounds**

6h

Preparation of aldehydes & ketones from acid chlorides, nitriles and carboxylic acids. Special methods of preparing aromatic aldehydes and ketones by Oxidation of arenes. Physical properties – absence of Hydrogen bonding. Reactivity of the carbonyl groups in aldehydes and ketones. Chemical reactivity: Addition of (a) NaHSO<sub>3</sub> (b) HCN (c) RMgX (d) 2,4-DNP (Schiff base). Addition of H<sub>2</sub>O to form hydrate, addition of alcohols - hemiacetal and acetal formation. Cannizzaro reaction. Oxidation reactions – KMnO<sub>4</sub> oxidation, reduction – catalytic hydrogenation, mechanism of Clemmensen reduction, Meerwein-Ponndorf-Verley reduction.

**MODULE III: PHYSICAL CHEMISTRY**

15 h (1h/week)

**Electrochemistry**

15h

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

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

**MODULE IV: GENERAL CHEMISTRY**

15 h (1h/week)

**Chemical Bonding**

5h

Molecular orbital theory: Shapes and sign convention of atomic orbitals. Modes of bonds. Criteria for orbital overlap. LCAO concept.  $\pi$  and  $\sigma$  overlapping. Concept of Types of molecular orbitals: bonding, antibonding and non-bonding. MOED of homonuclear diatomic molecules - H<sub>2</sub>, N<sub>2</sub>, O<sub>2</sub>, O<sub>2</sub><sup>-</sup>, O<sub>2</sub><sup>2-</sup>, F<sub>2</sub> (unhybridized diagrams only) and heteronuclear diatomics - CO, CN<sup>-</sup>, NO, NO<sup>+</sup> and HF, their bond order, stability and magnetic properties.

**Stereoisomerism**

5h

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

**Colligative Properties**

5h

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

**5. Reference Books**

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

**Module- I**

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

**Module- II**

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

**Module-III**

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

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

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

## c. IKS component:

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

## 7. Pedagogy

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

## 8. Course Assessment Plan

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

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

## b) Model Question Paper - End Semester exam Theory

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Faculty of Science – Department of Chemistry

MODEL PAPER

B.Sc. I YEAR SEMESTER -II

CHEMISTRY - II

Time: 2 hrs

Course Code: U26/DSC/CHE/201

Max. Marks: 60

## SECTION –A (Essay Questions)

## I. Answer the following

4x 10=40 Marks

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

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OR

6. a. State Kohlrausch law and mention its applications. 5M  
 b. Describe Hittorf method for the determination of Transport number. 5M
7. Write the postulates of MOT and explain the MOED of O<sub>2</sub>. 10M

OR

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

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

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

**Question Paper Format - Blooms Taxonomy Level**

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

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

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## c) Question Paper Blueprint

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

## 9. CO-PO Mapping

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

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**St. FRANCIS COLLEGE FOR WOMEN, BEGUMPET, HYDERABAD-500016**  
**(An Autonomous College Affiliated To Osmania University)**  
**FACULTY OF SCIENCE- DEPARTMENT OF CHEMISTRY**  
**SEMESTER -II**  
**LABORATORY COURSE-II - QUALITATIVE ANALYSIS**

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

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

**3. Course outcomes**

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

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

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

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

**Anions:**  $\text{CO}_3^{2-}$ ,  $\text{SO}_3^{2-}$ ,  $\text{S}^{2-}$ ,  $\text{Cl}^-$ ,  $\text{Br}^-$ ,  $\text{I}^-$ ,  $\text{CH}_3\text{COO}^-$ ,  $\text{NO}_3^-$ ,  $\text{PO}_4^{3-}$ ,  $\text{BO}_3^{3-}$ ,  $\text{SO}_4^{2-}$

**Cations:**  $\text{Hg}_2^{2+}$ ,  $\text{Ag}^+$ ,  $\text{Pb}^{2+}$

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

$\text{Al}^{3+}$ ,  $\text{Cr}^{3+}$ ,  $\text{Fe}^{3+}$

$\text{Mn}^{2+}$ ,  $\text{Co}^{2+}$ ,  $\text{Ni}^{2+}$ ,  $\text{Zn}^{2+}$

$\text{Ca}^{2+}$ ,  $\text{Ba}^{2+}$ ,  $\text{Sr}^{2+}$

$\text{Mg}^{2+}$ ,  $\text{NH}_4^+$

**Reference Books**

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

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

### 6. Model Question Paper - End Semester Exam Practical

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 -II

LABORATORY COURSE-II - QUALITATIVE ANALYSIS

Program: B.Sc.

Type of course: DSC-2

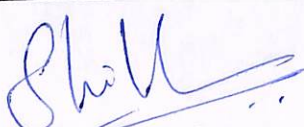


No. of credits: 1

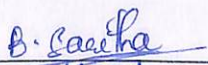
Course Code: U26/DSC/CHE/201/P

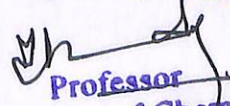
Time: 2 hrs

Max. Marks: 50

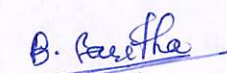
- Using systematic procedure, identify and report two anions and two cations present in the given an unknown salt mixture. 30M
- Record + Attendance 10M
- Viva voce 10 M

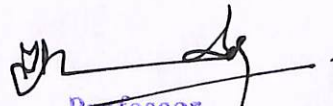
Prepared by	Checked & Verified by	Approved by
 Dr Shikha Chander  Ms V Prashanthi	 Dr Saritha Aduri HoD	 Prof. Uma Joseph Principal  <i>Principal</i> St. Francis College for Women Begumpet, Hyderabad-16.

  
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PANEL OF EXAMINERS							
FACULTY OF SCIENCES - DEPARTMENT OF CHEMISTRY							
CBCS-2026							
S · N o	Course Title	Examiner	Name & Designation	Place of Work	Yrs of Exp er i e n c e	Contact No.	Email Id.
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		Dr. S. Sreekanth	Dr. S. Sreekanth Assistant Professor of Organic Chemistry	Dept of Chemistry Veeranari Chakali Ilamma Women's University	22	8465945408	Sivan.sreekanth@gmail.com
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		Ms. M. Sujatha	Ms. M. Sujatha Assistant Professor of Organic Chemistry	Dept of Chemistry St. Ann's college for women	15	9866049923	sujatha.stanns09@gmail.com
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# **SEMESTER II**

## MICROBIOLOGY & IMMUNOLOGY

### 1. Course Description

**Programme:** B.Sc.  
**Course Code:** U26/BIT/DSC/201  
**Course Type:** DSC-2  
**No. of credits:** 4

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

### 2. Course Objectives

- To learn about the principles of microbiology and acquire an understanding of fundamental microbiological concepts as well as several ways for isolating pure cultures
- To understand an overview of different types of immunity, cells & organs involved in the immune system and comprehend the immunoglobulins and autoimmune disorders

### 3. Course Outcomes


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

**CO1:** Recognize and summarize the contributions of scientists in the field of Microbiology, gain an insight into characterization of microorganisms and apply skills in handling microscopes. ((REMEMBER, UNDERSTAND, APPLY) L I, II & III


**CO2:** Outline, apply and evaluate microbiological practices like Sterilization techniques, isolation, and culturing of microorganisms to study the microbial cells. (UNDERSTAND, APPLY, EVALUATE) L II, III & V

**CO3:** Remember, interpret, and use the basic concepts to have a comprehensive understanding of antigen-antibody interactions and their relevance in immunology (REMEMBER, UNDERSTAND) L I & II

**CO4:** Define, summarize, use, and analyze the knowledge, skills, and competencies to understand immunoassays effectively in various scientific and biomedical sciences (UNDERSTAND, ANALYZE) L II & IV

  
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#### 4. Course Content

##### **MODULE I: FUNDAMENTALS OF MICROBIOLOGY** (15HRS)

- 1.1 Historical development of Microbiology and Contributors of Microbiology
- 1.2 Basic Microscopy: Bright field microscopy, Dark field microscopy, Phase contrast microscopy
- 1.3 Advanced Microscopy: Fluorescent microscopy, Scanning and Transmission Electron microscopy
- 1.4 Introduction to Microorganisms (Archaea, Bacteria, Algae, Fungi, Mycoplasma and Viruses)
- 1.5 General characteristics of bacteria and virus, disease-causing pathogens, and symptoms (*Mycobacterium*, Hepatitis)
- 1.6 General characteristics and applications of micro-algae and fungi

##### **MODULE II: CULTURE AND IDENTIFICATION OF MICROORGANISMS** (15HRS)

- 2.1 Methods of sterilization - physical and chemical methods
- 2.2 Bacterial nutrition - nutritional types of bacteria, essential macro, micronutrients and growth factors.
- 2.3 Bacterial growth curve - batch and continuous cultures, synchronous cultures, measurement of bacterial growth-measurement of cell number and cell mass
- 2.4 Factors affecting bacterial growth
- 2.5 Culturing of anaerobic bacteria and viruses
- 2.6 Pure culture and its characteristics

##### **MODULE III: BASICS OF IMMUNOLOGY** (15HRS)

- 3.1 Types of Immunity - innate and adaptive Immunity
- 3.2 Cells of the immune system: T-cells (helper and cytotoxic cells), B-cells, Natural killer cells, Macrophages, Basophils and Dendritic cells
- 3.3 Primary organs of immune system - Thymus and Bone marrow
- 3.4 Secondary organs of immune system - Spleen and Lymph nodes
- 3.5 Antigens-immunogenicity vs antigenicity, factors affecting antigenicity, Epitopes,
- 3.6 Haptens & types of adjuvants

##### **MODULE IV: HUMORAL AND CELL MEDIATED IMMUNITY** (15HRS)

- 4.1 Structure of immunoglobulin - types and functions of immunoglobulins
- 4.2 Major Histocompatibility Complex (MHC) & Human Leukocyte Antigen (HLA)- role in organ transplantation
- 4.3 Cell mediated immunity- T-cell receptor (TCR), Antigen Presenting Cells (APCs), ternary complex (TCR, peptide & MHC); cytokines
- 4.4 Hypersensitivity- types I, II, III & IV
- 4.5 Autoimmunity- Mechanisms of autoimmunity; Autoimmune diseases - Systemic lupus erythematosus, Rheumatoid arthritis
- 4.6 Monoclonal antibody (MAbs) production and its applications, Vaccines

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### 5. Reference books

1. Biology of Microorganisms by: Brock, T.D. and Madigan, M.T.
2. Microbiology by: Prescott, L.M., Harley, J.P. Klein, D.A.
3. Microbiology by: Pelczar, M.J, Chan, E.C.S., Ereig, N.R.
4. Microbiological applications by: Benson
5. Essential Immunology. Publ: Blackwell by: Roitt I.
6. Immunology. Publ: Blackwell by: Reeve G. & Todd I.
7. Cellular and Molecular Immunology. Saunders Publication, Philadelphia by: Abbas A.K. Lichtman A.H., Pillai S.
8. Kubys Immunology. W.H. Freeman and Company by: Golds R.A., Kindt T.J., Osborne

### 6. Syllabus Focus

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

Local/Regional/National /Global Development Needs	Relevance
National Development (Module 1, 2 & 3)	Addressing Health, Agriculture, Environment, and industry challenges through Research Innovation with an interdisciplinary collaboration of Microbiology and immunology.
Global development (Module 4)	The course addresses global imperatives by fostering interdisciplinary scholarship, innovation, and sustainable solutions for pressing societal challenges.

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

SD/ED/EMP	Syllabus Content	Description of Activity
Skill Development	(Module 1 & 2)	Seminar presentations, Art projects, group discussions to understand and evaluate the basics of Microbiology and Immunology.

Employability	(Module 2, 3 & 4)	Hands on training on different media preparations, pure culture procedures, handling of varied microscopes and Immunoassays are useful in enhancing employability across a range of diagnostic and research labs.
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## 7. Pedagogy

S. No	Student Centric Methods Adopted	Type / Description of Activity
1.	Participative Learning	Seminar
2.	Experiential Learning	Quiz
3.	Participative Learning	Group Discussion
4.	Participative Learning	Presentation
5.	Experiential Learning	Art projects
6.	Problem Solving	Research projects
7.	Experiential Learning	Science experiments
8.	Experiential Learning	Internship opportunities

## 8. Course Assessment Plan

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

CO	Continuous Internal Assessments - CIA (40%)	End Semester Examination - (60%)
CO1	CIA-1 Written Exam	Written Exam
CO2	CIA-2 Quiz/ Assignment/Seminar Presentation	
CO3	CIA-1 Written Exam	
CO4	CIA-2 Presentation/ Art projects/ Science experiments/ Case studies	

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

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Faculty of Science – Department of Biotechnology**

**MODEL QUESTION PAPER**

**END SEMESTER EXAM**

**MICROBIOLOGY & IMMUNOLOGY**

**TIME: 2hrs**

**Course Code: U26/BIT/DSC/201**

**MAX.MARKS: 60**

**SECTION – A**

**I. Answer the following**

**4 x 10 = 40 M**

1. How would you summarize the principle and working of Transmission Electron Microscopy

OR

2. Illustrate the salient features of bacterial cell structure with well labelled diagrams

3. Explain about Batch culture. Add a detailed note on bacterial growth curve

OR

4. Define sterilization. Assess the different physical sterilization methods.

5. Contrast between Innate and adaptive immunity.

OR

6. Explain in detail Secondary organs of immune system

7. Analyze Major Histocompatibility Complex (MHC) & Human Leukocyte Antigen (HLA)- and its role in organ transplantation

OR

8. Summarize autoimmune response with suitable examples

**SECTION – B**

**II. Answer any FOUR of the following**

**4 x 5 = 20 M**

9. List the contributions of Louis Pasteur.


10. Demonstrate the factors affecting bacterial growth

11. Compare the isolation of different pure culture techniques

12. Describe Haptens

13. Analyse the role of APC in cell mediated immune response

14. Explain Monoclonal antibodies

  
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## SEMESTER-END MODEL QUESTION PAPER

SECTION A - INTERNAL CHOICE				
4 Q X 10 M = 40 M				
Question Number	Question	Question	CO	BTL (Blooms Taxonomy Level)
1	Module 1	How would you summarize the principle and working of Transmission Electron Microscopy	CO 1	II
2	Module 1	Illustrate the salient features of bacterial cell structure with well labelled diagrams	CO 1	III
3	Module 2	Explain about Batch culture. Add a detailed note on bacterial growth curve	CO 2	II
4	Module 2	Define sterilization. Assess the different physical sterilization methods.	CO 2	V
5	Module 3	Contrast between Innate and adaptive immunity	CO 3	II
6	Module 3	Explain in detail Secondary organs of immune system	CO 3	II
7	Module 4	Analyze Major Histocompatibility Complex (MHC) & Human Leukocyte Antigen (HLA)- and its role in organ transplantation	CO 4	IV
8	Module 4	Summarize autoimmune response with suitable examples	CO 4	II


SECTION B - ANSWER ANY 4 OUT OF				
6 4 Q X 5 M = 20 M				
(To compulsorily have ONE question from each module)				
9	Module 1	List the contributions of Louis Pasteur.	CO 1	I
10	Module 2	Demonstrate the factors affecting bacterial growth	CO 2	III
11	Module 3	Compare the isolation of different pure culture techniques	CO 2	IV
12	Module 4	Describe Haptens	CO 3	II
13	Any Module	Analyse the role of APC in cell mediated immune response	CO 4	IV
14	Any Module	Explain Monoclonal antibodies	CO 4	II


## c. Question Paper Blueprint

Modules	Hours Allotted in the Syllabus	COs Addressed	Section A (No. of Questions)	Total Marks	Section B (No. of Questions)	Total Marks
1	15	CO-1	2	10	6 questions with at least 1 from each module	5
2	15	CO-2	2	10		5
3	15	CO-3	2	10		5
4	15	CO-4	2	10		5

## 9. CO PO Mapping

CO	PO	Cognitive Level	Class room sessions (hrs)
1	1, 3, 7	Remember, understand, and apply	15
2	1, 2, 6, 7	Understand, apply and evaluate	15
3	1,2,7	Remember and understand	15
4	1,2,7	Understand and analyse	15

  
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**SEMESTER-II  
MICROBIOLOGY & IMMUNOLOGY - PRACTICAL**

**1. Course description**

**Programme: B.Sc.**  
**Course Code: U26/BIT/DSC/201/P**  
**Course Type: DSC-2**  
**No. of credits: 1**

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

**2. Course objective:**


- To aid students gain hands on experience in basic Microbiological techniques including aseptic handling, staining and culture methods and apply this knowledge in research or clinical findings.
- To provide hands-on training in fundamental immunological techniques and diagnostic procedures, enabling students to understand antigen–antibody interactions and immune response mechanisms.


**3. Course Outcomes:**

On completion of the course the student will be able to

**CO-1:** apply skills to prepare and sterilize media for isolation and culturing of microorganisms. **(APPLY & ANALYSE) L III & IV**


**CO-2:** Demonstrate and assess basic immunological techniques such as antigen–antibody reactions, blood grouping, and immunoassays. **(APPLY, EVALUATE) L III & V**


  
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### PRACTICAL SESSIONS

1. Sterilization methods – Autoclave, Hot Air Oven, Filtration
2. Preparation of microbiological media (bacterial, algal & fungal)
3. Isolation of bacteria by streak, spread and pour plate methods
4. Isolation of bacteria from soil
5. Simple staining and differential staining (Gram's staining)
6. Bacterial growth curve
7. Blood grouping
8. Single radial immunodiffusion
9. ELISA
10. Viability test of cells/bacteria (Evans blue test or tryphan blue test)

  
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**SEMESTER-II**  
**MICROBIOLOGY & IMMUNOLOGY -PRACTICAL**

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

Max. Marks: 50

Credits: 1

Time: 2Hrs




**I. MAJOR: (20M)**


Perform Gram's staining using the given sample and report the results. Write the principle and procedure for the same

**II. MINOR: (10M)**


Perform and report your blood group using the given sample. Write the principle and procedure for the same

**III. IDENTIFY THE GIVEN SPOTTERS: (10M)****IV. VIVA (5M)****V. RECORD (5M)**

Prepared by	Checked & verified by	Approved by
 <b>Dr. Deepa Switha</b> Teaching faculty	 <b>Ms. Shouni Niveditha</b> HoD	 <b>Prof. Uma Joseph</b> Principal

  
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## PANEL OF EXAMINERS

### FACULTY OF SCIENCE-DEPARTMENT OF BIOTECHNOLOGY

#### CBCS-2026

S.No.	B.Sc-Course Title	Examiner	Designation Place of Work	Years of Experience	Contact No.	Email Id.
1.	Semester I	Ms. D. Metilda Roselin	Asst. Prof., Dept of Genetics & Biotechnology, BVC	12	9160612832	metilda2324@gmail. com
		Dr.K.Madhuri	Associate Prof, Dept of Biotechnology, Mahatma Gandhi University	14	9000595973	madhuriphd09@yahoo. com
		Dr. Sushma Patkar	Asst. Prof, Dept of Genetics & Biotechnology, BVC	18	8790265800	Sushma.biotech @bhavansvc.ac. in
2.	Semester II	Dr.K.Madhuri	Associate Prof, Dept of Biotechnology, Mahatma Gandhi University	14	9000595973	madhuriphd09@yahoo. com
		Dr.T. Siva Ram	Asst. Prof, Dept of Biotechnology,	12	9032694559	<a href="mailto:tsram@outlook.com">tsram@outlook.com</a>
		Dr.Madhuri	Loyola Degree & PG College, Alwal	21	9849442334	

  
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**SEMESTER II**  
**Core Course 2**  
**BIOMOLECULES AND MICROBIAL PHYSIOLOGY**

**Code :U26/MIC/DSC/201**

**Credits : 4**

**Total hours : 60**

**Hours/week : 4**

**Module I : INTRODUCTION TO BIOMOLECULES**

**Module II : MICROBIAL GROWTH AND METABOLISM**

**Module III : AEROBIC RESPIRATION & PHOTOTROPHISM**

**Module IV : ANAEROBIC RESPIRATION & FERMENTATION**

## SEMESTER –II

## BIOMOLECULES AND MICROBIAL PHYSIOLOGY

## 1. Course Description:

Programme: B.Sc.  
Course Code: U26/MIC/DSC/201  
Course Type: Discipline Specific Core  
No. of credits: 4

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

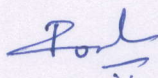
## 2. Course Objectives:

- This course will help the students gain knowledge about the Microbial physiology and metabolism by understanding microbial nutrition and growth characteristics.
- Differentiating concepts of aerobic and anaerobic respiration and how these are manifested in the form of different metabolic pathways in microorganisms.

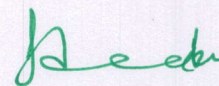
## 3. Course Outcomes:

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

- CO 1: Gain knowledge in concepts related to biomolecules like carbohydrates, amino acids, and lipids (L II), (L III)
- CO2: Understand central metabolic pathways, energy production and growth characteristics. (LII)
- CO 3: Attain insight about aerobic respiration and Photosynthesis of Green, Purple bacteria and Cyanobacteria. (L IV)
- CO4: Analyse the concepts of anaerobic respiration and fermentation through different metabolic pathways in microorganisms. (L IV)



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

Carbohydrates: Monosaccharides: Aldoses & ketosis, Epimers, Muta-rotation and anomers of glucose, Sugar derivatives. Glucosamine, Galactosamine, Muramic acid, N-acetyl neuramic acid, Disaccharides, and polysaccharides

Amino acids and proteins: Types, Structure, and functions. Classification of enzymes. Active site and activation energy. Lock and key hypothesis. Induced-fit hypothesis.

Lipids: Physico, chemical, and biological properties of lipids. Introduction to storage and structural lipids. Storage lipids: Triglycerols, Building blocks, Fatty acid structure, and properties, essential Fatty acids. Saponification. Structural lipids. Phosphoglycerides- building blocks.

**MODULE II - MICROBIAL GROWTH AND METABOLISM:****(15Hrs)**

Nutritional requirements of microbes, nutrient uptake. Definitions of growth, Batch culture, Continuous culture, generation time and specific growth rate. Synchronous growth, diauxic growth curve. Measurement of microbial growth. Microbial growth in response to environment - Temperature (psychrophiles, mesophiles, thermophiles, extremophiles, thermodurics, psychrotrophs), pH (acidophiles, alkaliphiles), Solute and water activity (halophiles, xerophiles, osmophiles), Oxygen (aerobic, anaerobic, microaerophilic, facultative aerobe, facultative anaerobe), barophiles with examples.

**MODULE III- AEROBIC RESPIRATION & PHOTOTROPHISM:****(15 Hrs)**

Sugar degradation pathways i.e. EMP, ED, Pentose phosphate pathway, TCA cycle, Electron transport chain. Introduction to phototrophic metabolism - groups of phototrophic microorganisms, anoxygenic vs. oxygenic photosynthesis with reference to phototrophism in Green bacteria, Purple bacteria, Cyanobacteria.

**MODULE IV- ANAEROBIC RESPIRATION & FERMENTATION:****(15Hrs)**

Anaerobic respiration with special reference to dissimilatory nitrate reduction (Denitrification; nitrate /nitrite and nitrate/ammonia respiration; fermentative nitrate reduction Fermentation- Alcohol fermentation and Pasteur effect; Lactate fermentation (homofermentative and heterofermentative pathways), concept of linear and branched fermentation pathways. Introduction to traditional fermentation.

**Resources:****5a. Text Books:**

1. A textbook of Microbiology, Biomolecules (2026). Dr. Chand Pasha and Dr. Hameeda Bee. Professional Books Publisher.
2. Joanne M. Willey, Linda M Sherwood, Christopher J Woolverton (2011). Prescott's Microbiology. 8<sup>th</sup> edition, Mc.Graw Hill publishers.
3. Reddy SR and Reddy SM. (2005). Microbial Physiology. Scientific Publishers India.

**5b. Reference Books:**

1. Madigan MT, and Martinko JM (2014). Brock Biology of Microorganisms. 14<sup>th</sup> edition. Prentice Hall International Inc.
2. Moat AG and Foster JW. (2002). Microbial Physiology. 4<sup>th</sup> edition. John Wiley & Sons.
3. Stanier RY, Ingrahm JI, Wheelis ML and Painter PR. (1987). General Microbiology. 5<sup>th</sup> edition, McMillan Press.
4. Gopal Reddy *et al*, (2006), Laboratory experiments in Microbiology, Himalaya Publishers.
5. Prescott, Harley and Klein Wim. (2002), Microbiology, Mc.Graw Hill Publishers.
6. R.C Dubey, D.K Maheshwari, Practical Microbiology, S Chand and Company, New Delhi.
7. Cappucino J and Sherman N. (2010). Microbiology: A Laboratory Manual. 9<sup>th</sup> edition. Pearson Education Limited.

**5c. Online Resources:**

1. <http://webbuild.knu.ac.kr/~apmic//introduction%20to%20microbiology/chap8-metabolism.pdf>
2. [https://bio.libretexts.org/Bookshelves/Microbiology/Microbiology\\_\(OpenStax\)/08%3A\\_Microbial\\_Metabolism](https://bio.libretexts.org/Bookshelves/Microbiology/Microbiology_(OpenStax)/08%3A_Microbial_Metabolism)
3. <https://www.ncbi.nlm.nih.gov/books/NBK7919/>
4. <https://microbenotes.com/anaerobic-respiration/>
5. <https://www.khanacademy.org/science/ap-biology/cellular-respiration-ap/a/fermentation-and-anaerobic-respiration>

## 6. Syllabus Focus:

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

Module	FOCUS Local/Regional/National /Global Development Needs	Relevance
Module I	National & Global	Understanding biomolecules helps in the development of drugs, vaccines, and diagnostic tools used in treating diseases.
Module II	Global	The study of microbial nutrition, growth patterns, and environmental responses is globally important for medicine, biotechnology, food production, environmental sustainability, and industrial microbiology.
Module III	National & Global	Knowledge of Aerobic Respiration helps explain microbial energy production and its applications in biotechnology and environmental processes. Phototrophic bacteria are important for sustainable technologies such as carbon sequestration and renewable bioenergy production.
Module IV	National & Global	The study of anaerobic metabolism is essential for understanding microbial roles in global nutrient cycles and environmental sustainability. Microbial fermentation processes such as Lactic Acid Fermentation are widely used in the production of fermented foods and industrial bioproducts.

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

FOCUS Skill Development /Entrepreneurship Development /Employability	Syllabus Content	Description of Activity
Skill Development	MODULE II	<p>To facilitate the learning process, the students would be trained to cultivate bacteria in different environmental conditions to demonstrate as how it affects their growth and patterns. Problems based questions will be framed to calculate the generation time of bacteria.</p> <p>This procedure aims at developing the skills necessary to analyze different (and perhaps more complex) metabolic processes.</p>

## c) IKS Component

IKS	Syllabus Content	MODULE
IKS	Introduction to traditional fermentation.	IV

d) Aligned with SDG 3 (Good health and wellbeing) SDG 4 (Quality education)

## 7. Pedagogy:

S. No	Student Centric Methods Adopted	Type / Description of Activity
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

Maximum Marks: 20M		Maximum Marks: 20M	
CIA 1	CIA 2	Skill Base Test: 10M	Assignment: 10M
<b>Section A: 1x10=10M</b> Essay question: Answer any 1 out of 2  <b>Section B: 2x5=10M</b> Short questions: Answer any 2 out of 3	<b>Section A: 1x10=10M</b> Essay question: Answer any 1 out of 2  <b>Section B: 2x5=10M</b> Short questions: Answer any 2 out of 3	Discretion of the faculty	Discretion of the faculty

External QP Pattern		
4 Credits 4 Modules (CORE)	SECTION A - Internal Choice	4 Q X 10 M = 40M
	SECTION B – Answer any 4 out of 6 (To compulsorily have ONE question from each module)	4 Q X 5 M = 20M

## b) Aligning COs with Continuous Internal Assessments

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	

## b) Model Question Paper- End Semester Exam

## BIOMOLECULES AND MICROBIAL PHYSIOLOGY

Course Code: U26/MIC/DSC/201

Max. Marks: 60

Credits: 4

Time: 2 Hrs.

SECTION A - INTERNAL CHOICE		4 Q X 10 M = 40 M			
Q.No	Question	Module	CO	BTL	
1	Question	Module I	CO 1	II, III	
OR					
2	Question	Module I	CO 1	II, III	
OR					
3	Question	Module II	CO 2	II	
OR					
4	Question	Module II	CO 2	II	
OR					
5	Question	Module III	CO 3	IV	
OR					
6	Question	Module III	CO 4	IV	
OR					
7	Question	Module IV	CO 4	IV	
OR					
8	Question	Module IV	CO 4	IV	

SECTION B - ANSWER ANY 5 OUT OF 8		5 Q X 4 M = 20 M			
Q.No	Question	Module	CO	BTL	
9	Question	Module I	CO 1	II	
10	Question	Module I	CO 1	III	
11	Question	Module II	CO 2	II	
12	Question	Module II	CO 2	II	
13	Question	Module III	CO 3	III	
14	Question	Module III	CO 4	IV	

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## c. Question paper pattern

SECTION A - INTERNAL CHOICE				4Q X 10 M = 40 M	
Question Number	Module	Question	CO	BTL (Blooms Taxonomy Level)	
1	Module I	Explain the structural differences between monosaccharides, disaccharides, and polysaccharides with suitable examples.	CO 1	Level II, III	
2	Module I	Describe the structural and functional differences between storage lipids and structural lipids.	CO 1	Level II, III	
3	Module II	How would you classify the different phases of bacterial growth curve with different types of microorganisms and environmental conditions.	CO 2	Level II	
4	Module II	What can you write about the different methods involved in measurement of microbial growth.	CO 2	Level II	
5	Module III	How can you identify the various steps involved in EMP pathway	CO 3	Level IV	
6	Module III	What is the original way to differentiate between Oxygenic and Anoxygenic photosynthesis with examples.	CO 3	Level IV	
7	Module IV	What conclusions can you draw between dissimilatory and assimilatory nitrate reduction.	CO 4	Level IV	
8	Module IV	Compare and contrast between homo-lactic acid and Hetero-lactic acid fermentation	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	Compare and contrast Disaccharides from Polysaccharides	CO 1	Level III	
10	Module I	Explain Lock and Key Hypothesis	CO 1	Level II	
11	Module II	Explain about Synchronous growth	CO 2	Level II	
12	Module II	Compare and contrast Halophiles and Osmophiles	CO 2	Level II	
13	Module III	Construct the steps involved in ED pathway	CO 3	Level III	
14	Module IV	Justify Pasteur effect	CO 4	Level IV	

## a) Question Paper Blueprint:

Modules	Hours Allotted in the Syllabus	COs Addressd	Section A (No. of Questions)	Total Marks	Section B (No. of Questions)	Total Marks
1	15	CO-1	2	10	2	5
2	15	CO-2	2	10	2	5
3	15	CO-3	2	10	2	5
4	15	CO-4	2	10	2	5

## 9. CO-PO Mapping:

CO	PO	Cognitive Level	Class room sessions (Hrs)
1	1	Remember	15
2	1, 2	Understand	15
3	1	Analyse	15
4	1, 2	Analyse	15

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Department of Microbiology  
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**BIOMOLECULES AND MICROBIAL PHYSIOLOGY**  
**Practical Syllabus****1. Course Description:****Programme: B.Sc****Course Code: U26/MIC/DSC/201/P****Max. Hours: 30****Course Type: Discipline Specific Core****Hours per week:2****No. of credits: 1****Max. Marks: 50****2. Course Objectives:**

- To enable the students to understand the growth pattern and factors affecting bacterial growth by performing bacterial growth curve experiments.
- To equip and expose students to various culturing techniques for growth of specific microorganisms.

**3. Course Outcomes:**

**CO 1:** Measuring microbial growth, calculate growth kinetic parameters of steady state and continuous growth.

**CO 2:** Analyze the growth characteristics of the microorganisms capable of growing under different environmental conditions of temperature, oxygen, and solute and water activity.

**4. Course Content:**

1. Enrichment culturing and isolation of phototrophs.
2. Culturing and isolation of chemoautotrophs- nitrifiers.
3. Study and plot the growth curve of *E. coli* by turbidometric method.
4. Determination and study of growth curve by standard plate count methods.
5. Calculation of generation time and specific growth rate of bacteria from the graph plotted with the given data.
6. Determination of viable count of bacteria.
7. Effect of temperature, pH and salt on growth of *E. coli*.
8. Effect of carbon and nitrogen sources on growth of *E.coli*.
9. Demonstration of the thermal death time and decimal reduction time of *E. coli*.
10. Cultivation of Anaerobic bacteria from dental samples and acne.
11. Study the growth pattern of Thermophiles and Alkaliphiles.



**Dr. Hameeda Bee**  
Professor

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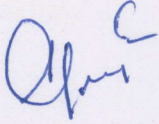
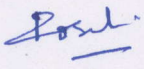
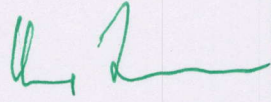
Course Code: U26/MIC/DSC/201/P

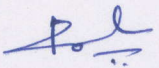
Max Marks: 50

Credits: 1

Time: 2 Hrs

I. MAJOR	20M
II. MINOR	10 M
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	 Prof. Uma Joseph

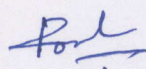
  
**HOD Microbiology**  
 St. Francis College for Women  
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**Dr. Hameeda Bee**  
 Professor  
 Department of Microbiology  
 Osmania University, Hyd-07

## Panel of Examiners

## BSc Semester I and II

S. No	B.Sc- Course Title	Examiner	Designation Place of Work	Years of Experience	Contact No.	Email Id.
1.	Sem I Bacteriology and Systematics	Dr. Anuradha	Assistant Professor Bhavans College	26	9849977396	<a href="mailto:anuradhapmv@gmail.com">anuradhapmv@gmail.com</a>
2.		Dr. Jeevitha	Assistant Professor MNR College	7	9791759105	<a href="mailto:jeevithathangaraj@gmail.com">jeevithathangaraj@gmail.com</a>
3.	Sem II Biomolecules & Microbial physiology	Dr. Ramchander	Assistant Professor Mahathma Gandhi University	20	9989427725	<a href="mailto:rajumerugu01@rediffmail.com">rajumerugu01@rediffmail.com</a>
4.		Ms. Rajeetha.M	Assistant Professor St Pious College	7	9000285314	<a href="mailto:rajeetha.mondal@gmail.com">rajeetha.mondal@gmail.com</a>



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