# KRISHNA UNIVERSITY, MACHILIPATNAM
# ANDHRA PRADESH, INDIA

# Department of Biochemistry

## Syllabus for Single Major Program in Biochemistry

**4 year B.Sc. Biochemistry honors, Under CBCS**

## Approved by Board of Studies

## (2025-2026)

*Date: 17-11-2025*

# KRISHNA UNIVERSITY

**Prof. N. Usha**
**REGISTRAR (I/C)**
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**Machilipatnam-521004.**
Mobile : 9440136169
E-mail : registrarku@gmail.com

No.KRU/AAC/Board of Studies/Biochemistry/2025 Dated: 28-03-2025

Sub: KU – Academic Audit – The constitution of the UG Board of Studies (BoS) members in Biochemistry for the approval of the Under Graduation (UG) CBCS syllabus w.e.f 2023-24 (APSCHE-AC-Revision of syllabus under CBCS with effect from 2023-24 syllabus) – Reg.

Read: Note order's of the Vice-Chancellor, dt: 27-03-2025.

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**ORDER:**

In accordance with the provisions contained by the Krishna University act No:29 of 2008 of A.P. Govt., Hon'ble Vice-Chancellor is pleased to partially modify the Board of Studies in Faculty of Biochemistry with the following members.

| UG BOARD OF STUDIES FOR BIOCHEMISTRY | | |
|---|---|---|
| **S.No.** | **Name of the Faculty** | **Designation** |
| 1 | Dr. Syed Vaziha Tahaseen<br>SRR & CVR. Government Degree College (A), Vijayawada<br>Mobile: 9948740949, E-Mail: vazeehatahaseensiraj@gmail.com | Chairperson |
| 2 | Dr. P. Pallavi<br>Sri Durga Malleswari Siddhadha Mahila Kalasala (A)<br>Vijayawada<br>Mobile: 7780754355, E-Mail: Pallavipasupulet88@gmail.com | Member |
| 3 | Dr. R Gangaraju<br>Maris Stella College, Vijayawada<br>Mobile:9652128202, 9398153424, E-Mail:gangarajurapaka@gmail.com | Member |
| 4 | Dr. Kishore Babu<br>Laila Neutraceuticals, Vijayawada<br>Mobile: 9908630910, E- Mail: kishorempharm@gmail.com | Industrialist |
| 5 | Dr. J. Naveena Lavanya Latha<br>Department of Biosciences & Biotechnology<br>Krishna University, Machilipatnam | University Nominee |
| 6 | Ms. Dumpa Hyma<br>SRR & CVR Government Degree College ,Vijayawada<br>Mobile: 8309580742, E-Mail: dumpahyma396@gmail.com | Student Member-1 |
| 7 | Mr. K Srinivas<br>SRR & CVR Government Degree College ,Vijayawada<br>Mobile: 9491792101, E-Mail: srinivaskasireddy179@gmail.com | Student Member-2 |

The term of office of all the members including the chairman of Board of studies until further orders with effect from the date of the order or until the new boards of studies are constituted.

These orders shall come in to force with immediate effect.

**(BY ORDER)**

**S/d**
**REGISTRAR (I/C)**

Copy to:
The Chairperson & all members of UG Board of Studies of the above
All Directors and Principals of the University and Constituent Colleges/Units
PA's to Vice-Chancellor/Registrar KRU
Accounts Section/Establishment Section
File.

Digitally signed by Nekkalapudi Usha
Date: 29-03-2025 16:18:15

# KRISHNA UNIVERSITY, MACHILIPATNAM

## BOARD OF STUDIES- BIOCHEMISTRY- SINGLE MAJOR

. 1. Dr. Syed Vaziha Tahaseen, M.Sc., M.Phil., Ph.D., B.Ed. Chairperson
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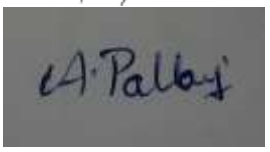
Vijayawada
Pallavipasupuleti88@gmail.com
Mobile - +917780754355



3. Dr. R. Gangaraju M Sc., PhD
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# ANDHRA PRADESH STATE COUNCIL OF HIGHER EDUCATION

## Model Syllabus for 4-Year UG Honours in B.Sc. (Biochemistry) as Major in consonance with Curriculum framework w.e.f. AY 2025-26

## Prepared by Sri Venkateswara University, Tirupati

**COURSE STRUCTURE**

| Year | Semester | Course | Title of the Course | No. of Hrs /Week | No. of Credits |
|---|---|---|---|---|---|
| I | I | 1 | Biomolecules | 3 | 3 |
| | | | Biomolecules-Practical | 2 | 1 |
| | | 2 | Cell Biology | 3 | 3 |
| | | | Cell Biology-Practical | 2 | 1 |
| | II | 3 | Genetics and Molecular Biology | 3 | 3 |
| | | | Genetics and Molecular Biology Practical | 2 | 1 |
| | | 4 | General Physiology | 3 | 3 |
| | | | General Physiology-Practical | 2 | 1 |
| II | III | 5 | Analytical techniques | 3 | 3 |
| | | | Analytical techniques-Practical | 2 | 1 |
| | | 6 | Basic Microbiology | 3 | 3 |
| | | | Basic Microbiology-Practical | 2 | 1 |
| | | 7 | Immunology | 3 | 3 |
| | | | Immunology-Practical | 2 | 1 |
| | IV | 8 | Enzymology | 3 | 3 |
| | | | Enzymology-Practical | 2 | 1 |
| | | 9 | Bioenergetics and Membrane biology | 3 | 3 |
| | | | Bioenergetics and Membrane biology-Practical | 2 | 1 |
| | | 10 | Endocrinology | 3 | 3 |
| | | | Endocrinology-Practical | 2 | 1 |
| III | V | 11 | Molecular Biology | 3 | 3 |
| | | | Molecular Biology-Practical | 2 | 1 |
| | | 12 | Nutritional Biochemistry | 3 | 3 |

| Year | Semester | Course | Title of the Course | No. of Hrs /Week | No. of Credits |
|---|---|---|---|---|---|
| | | | Nutritional Biochemistry-Practical | **2** | **1** |
| | | **13** | Intermediary Metabolism-I | **3** | **3** |
| | | | Intermediary Metabolism-I-Practical | **2** | **1** |
| | **VI** | **14** | Intermediary Metabolism -II | **3** | **3** |
| | | | Intermediary Metabolism -II-Practical | **2** | **1** |
| | | **15** | Clinical Biochemistry | **3** | **3** |
| | | | Clinical Biochemistry-Practical | **2** | **1** |
| **IV** | **VII** | **16** | Recombinant DNA technology and Biotechnology | **3** | **3** |
| | | | Recombinant DNA technology and Biotechnology-Practical | **2** | **1** |
| | | **17** | Molecular Basis of Infectious diseases | **3** | **3** |
| | | | Molecular Basis of Infectious diseases-Practical | **2** | **1** |
| | | **18** | Nutraceuticals | **3** | **3** |
| | | | Nutraceuticals-Practical | **2** | **1** |
| | | **19** | Applied Biochemistry | **3** | **3** |
| | | | Applied Biochemistry-Practical | **2** | **1** |
| | | **20** | Fundamentals of Biostatistics & Bioinformatics | **3** | **3** |
| | | | Fundamentals of Biostatistics & Bioinformatics-Practical | **2** | **1** |
| | **VIII** | **21** | Plant and Environmental Biochemistry | **3** | **3** |
| | | | Plant and Environmental Biochemistry-Practical | **2** | **1** |
| | | **22** | Molecular Basis of Non-infectious diseases | **3** | **3** |
| | | | Molecular Basis of Non-infectious diseases-Practical | **2** | **1** |
| | | **23** | Ecological Principles | **3** | **3** |
| | | | Ecological Principles-Practical | **2** | **1** |
| | | **24** | Food safety and Quality Management | **3** | **3** |
| | | | Food safety and Quality Management-Practical | **2** | **1** |
| | | **25** | Biotechnology and Nanotechnology | **3** | **3** |
| | | | Biotechnology and Nanotechnology-Practical | **2** | **1** |

# DEPARTMENT OF BIOCHEMISTRY

## Board of Studies Meeting for the year 2025-26

## Agenda

1. To verify and approve the B.Sc -Honors in Biochemistry: MAJOR programme and B.Sc -Honors Biochemistry Minor programme structure
2. To design the syllabus as per NEP 2020 to promote multidisciplinary learning, research skills, employability, and flexibility through a credit-based, outcome-oriented structure aligned with local and global scientific needs.
3. To approve Semester 1 paper 1 syllabus, blueprint, model paper, and Practical Paper syllabus
4. To approve Semester 1 paper 2 syllabus , blueprint, model paper, and Practical Paper syllabus
5. To approve Semester 2 paper 3 syllabus, blueprint, model paper, and Practical Paper syllabus
6. To approve Semester 2 paper 4 syllabus, blueprint, model paper, and Practical Paper syllabus

## .*BOARD OF STUDIES MEETING FOR THE ACADEMIC YEAR 2025-26*

**Report on the Board of Studies Meeting – Biochemistry Department**

A Board of Studies (BoS) meeting was conducted online on **17th November 2025** at 11**:00 AM**, with the participation of the designated members appointed by Krishna University. The following dignitaries were present:

- **Chairperson**: Dr. Syed Vaziha Tahaseen
- **Members**: Dr. A. Pallavi and Dr. Ganga Raju
- **University Nominee**: Dr.J, Naveenana Lavanya Latha
- **Alumnae Representatives**: Ms. Sathvika and Ms. Siri from SRR & CVR Government Degree College

The agenda of the meeting was to revise and approve the Biochemistry APSHE syllabus in accordance with the **National Education Policy (NEP) 2020** and the **Choice-Based Credit System (CBCS)** framework with suggested modifications.

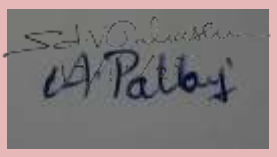
### Key Decisions and Discussions:

1. **Semester 1**
    - The syllabus for **Papers 1 and 2** was thoroughly reviewed and **Approved**.
    - .
2. **Semester II**
    - The core syllabi for **Papers 3 and 4 were** discussed.
    - Various **modifications and improvements** were suggested and incorporated based on expert deliberations.

### Additional Highlights:

- The meeting included **extensive deliberations** on each course, and **valuable suggestions** were made by all members.
- All proposed modifications were compiled and presented below in a **tabulated format** with clear **justifications** for each change.
- The recommendations provided by the **Vice Chancellor of Krishna University** during a recent summer vacation meeting were also thoroughly considered and integrated where relevant.

| Course No. | Title of the Paper | Unit Number | Modifications done | Justification |
|---|---|---|---|---|
| 01 | Biomolecules | ALL Units | Galctomannas and Ramachandran plot are and | Included as additional inputs |
| 01 | Biomolecules | Unit V | Porphyrin types | Included |
| 02 | Cell Biology | All Units | Syllabus is neatly aligned | Alignment is required concept wise in sequence |
| 03 | Genetics | Unit 1 | Classical genetics topics are included | Fundamentals of Mendelian genetics must be included |
| 03 | Genetics | Unit 2 | Inheritance topics are included | To go from fundamentals to advanced topics |
| 03 | Genetics | Unit 3 | Molecular biology topics are included as chapters 3,4,5 | |
| 04 | General Physiology | Unit 2 | Mechanism of muscle contraction has been added. | To understand how muscles function during contraction and |




# KRISHNA UNIVERSITY

## Machilipatnam, Andhra Pradesh

**Program & Semester: B.Sc. Biochemistry Honours – Semester**

**I Course No.:01**

**Title of the Course:** Biomolecules

**Total Teaching Hours: 45 Hours (3 hours/week – Theory)**

**Credits:3**

**Course Objectives**

1. To understand the biological relevance of buffers in maintaining cellular and physiological pH balance.
2. To understand the roles of carbohydrates in energy storage, cell recognition, and as structural components in organisms.
3. To differentiate between saturated and unsaturated fatty acids, and analyze the properties of fats, oils, and phospholipids.
4. To explore the structures and functions of proteins, including their classification, amino acid composition, and various levels of structural organization.
5. To understand the significance of nucleic acids, including the structure of DNA and RNA, their stability, and roles in genetic information storage and transmission.

**Course Outcomes**

**CO1** – Understand the molecular basis of life by exploring biomolecular interactions and properties, connecting structures to biological functions.
**CO2** – Apply principles like pH regulation, buffers, and osmosis to solve real-world biological challenges and maintain cellular balance.
**CO3** – Analyze the structures of carbohydrates, lipids, proteins, and nucleic acids, linking them to specific biological functions for deeper insights.
**CO4** – Recognize biochemistry's interdisciplinary nature, fostering critical thinking and preparing for scientific exploration and contributions.

**Course Content**

*UNIT I: Fundamentals of Biochemistry*

History, scope, and avenues of Biochemistry.
Water as a biological solvent.
Measurement of pH, buffers, and biological relevance of buffers.
Outline of surface tension, adsorption, and osmosis with their biological relevance.

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*UNIT II: Carbohydrates*

Classification of carbohydrates; monosaccharides – D and L designations, open-chain and cyclic structures, epimers, and anomers, mutarotation.

Reactions of carbohydrates (due to hydroxyl, aldehyde, and ketone groups).
Amino sugars and glycosides.

Structure and biological importance of disaccharides (sucrose, lactose, maltose) and polysaccharides (starch, glycogen)., Glycosaminoglycans.

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**Additional Input:** Galactomannan.

### *UNIT III: Lipids*

Classification of fatty acids; structure of saturated and unsaturated fatty acids.
Properties of fats and oils (acid, saponification, and iodine values; rancidity).
Classification and general properties of lipids.
Structure and functions of phospholipids and lipoproteins.

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Types and biological roles of lipoproteins.

### *UNIT IV: Amino Acids and Proteins*

Classification, structure, and stereochemistry of amino acids.
Chemical reactions due to amino and carboxyl groups.
Titration curve of glycine and its pK
values. Non-protein amino acids.
Peptide bond formation.
Classification of proteins based on solubility, shape, and
function. Denaturation and renaturation of proteins.
Levels of structural organization – primary, secondary, tertiary, and quaternary.

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**Additional Input:** Ramachandran plot.

### *UNIT V: Nucleic Acids and Porphyrins*

Types and structures of DNA and RNA.
Structure of purines and pyrimidines, nucleosides, and nucleotides.
Stability and formation of phosphodiester linkages.
Effect of acids, alkali, and nucleases on DNA and RNA.
Watson–Crick model of DNA, denaturation and renaturation, Tm values and their significance, Cot curves and their relevance.
Basic structures and biological functions of porphyrins – Heme, chlorophyll, cytochromes, and vitamin $B_{12}$.

**References**

1. Jain, J.L., Jain, S., Jain, N. – *Fundamentals of Biochemistry*, S. Chand & Co.
2. Satyanarayana, U., Chakrapani, U. – *Biochemistry*, Books & Allied Pvt. Ltd.
3. Nelson, D.L., Cox, M.M. – *Lehninger's Principles of Biochemistry*, Freeman & Co., 7th Edition.

**Web Links**

1. http://aulanni.lecture.ub.ac.id/files/2012/01/15616949-Lehninger-Principles-of-
2. **Biochemistry-1-copy.pdf**
3. **https://ncert.nic.in/textbook/pdf/kebo109.**
   **pdf**
4. **https://unacademy.com/content/wp-content/uploads/sites/2/2022/10/32.-**

# KRISHNA UNIVERSITY

## Machilipatnam, Andhra Pradesh

**PRACTICAL COURSE**
**Title: Biomolecules (Practical)**
**Total Teaching Hours: 30 Hours (2 hrs/week – Practical)**

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**Course Objectives**

1. To understand the principle behind qualitative and quantitative biochemical estimations.
2. To apply theoretical knowledge in the identification and analysis of biomolecules.

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**List of Experiments**

1. Safety measures in biochemistry laboratories.
2. Preparation of buffers (acidic, neutral, and alkaline) and determination of pH.
3. Qualitative identification of carbohydrates – glucose, fructose, ribose/xylose, maltose, sucrose, lactose, starch/glycogen.
4. Qualitative identification of amino acids – histidine, tyrosine, tryptophan, cysteine, arginine.
5. Qualitative identification of lipids – solubility, saponification, acrolein test, Salkowski test, Liebermann–Burchard test.
6. Determination of pKa of acetic acid and glycine.

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**Course Outcomes**

1. Understand the classification, structure, and chemical properties of carbohydrates, lipids, and amino acids.
2. Acquire knowledge about the structure and biochemical role of porphyrins and nucleic acids.

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**Recommended Books**


1. Jain, J.L., Jain, S., Jain, N. – *Fundamentals of Biochemistry*, S. Chand & Co.
2. Satyanarayana, U., Chakrapani, U. – *Biochemistry*, Books & Allied Pvt. Ltd.
3. Nelson, D.L., Cox, M.M. – *Lehninger's Principles of Biochemistry*, Freeman & Co., 7th Edition.


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# KRISHNA UNIVERSITY

## Machilipatnam, Andhra Pradesh

*BLUEPRINT*

**Program & Semester:** B.Sc. Biochemistry Honours – Semester 1

**Course No.: 01**

**Title of the Course:**
**Biomolecules**

**Time:** 3 Hours

**Max. Marks: 7**0

| Sl. No. | Unit | Short Answer (4M) | Q. No. | Essay (10 M) | Q. No. |
|---|---|---|---|---|---|
| 1 | Unit I | 2 | 1 & 2 | 2 | 9 & 10 |
| 2 | Unit II | 1 | 3 | 2 | 11 & 12 |
| 3 | Unit III | 2 | 4 & 5 | 2 | 13 & 14 |
| 4 | Unit IV | 1 | 6 | 2 | 15 & 16 |
| 5 | Unit V | 2 | 7 & 8 | 2 | 17 &18 |

*Total Marks: 70*

- **Section A**: Any 5 out of 8 questions (Short answers) – 5×4 = 20 Marks
- **Section B**: All 5 questions (Essays with choice) – 5×10 = 50 Marks

# KRISHNA UNIVERSITY

## Machilipatnam, Andhra Pradesh

**Model Question Paper**

**Program & Semester:** B.Sc. Biochemistry Honours – Semester I
**Course No.:** 01
**Title of the Course:** Biomolecules
**Time:** 3 Hours **Maximum Marks:** 70

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**Part – A (Short Answers)**

Answer any FIVE of the following: 5 × 4 = 20 Marks

1. Surface tension – biological significance.
2. Structure and biological importance of disaccharides.\
3. Saturated and unsaturated fatty acids.
4. Types and functions of lipoproteins.
5. Titration curve of glycine.
6. Ramachandran plot.
7. Denaturation and renaturation of nucleic acids.
8. Structure of heme

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**Part – B (Essay Questions)**

Answer ALL the following: 5 × 10 = 50 Marks

9. Explain the role of water as a biological solvent in living systems.
   **OR**
   Discuss the biological relevance of buffers.
10. Explain the classification of carbohydrates.
    **OR**
    Write about storage polysaccharides.
11. Discuss the structure and classification of lipids.
    **OR**
    Write about prostaglandins – structure, types, and biological role.
12. Describe the classification and structural organization of proteins.
    **OR**
    Explain protein denaturation and renaturation.
13. Elaborate on the Watson–Crick DNA double helix structure and explain Tm values and their biological significance.
    **OR**
    Discuss the types and functions of RNA molecule

# KRISHNA UNIVERSITY

## Machilipatnam, Andhra Pradesh

**Program & Semester:** B.Sc. Biochemistry Honours – Semester I

**Course No.:**2

**Title of the Course: CELL BIOLOGY**

**Total Teaching Hours:** 45 Hours (3 hrs/week – Theory)

**Credits:** 3

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**Course Objectives**

1. To compare and contrast the functions of cell organelles in maintaining cellular processes.
2. To understand the fundamentals of membrane biology and its role in cellular function.
3. To differentiate between mitosis and meiosis, highlighting their significance in cell division.
4. To identify various types of signaling molecules and explain their roles in intercellular communication.
5. To define protein sorting and recognize its importance in maintaining cellular compartmentalization.

**Course Outcomes**

**CO1**: Understand the structural differences between prokaryotes and eukaryotes
**CO2**: Apply understanding to membrane transport to specific ion and molecules movement
**CO3**: Analyze signal transduction pathways and their components. Formulate creative an innovative therapeutic approach
**CO4**: Using the principles of cell biology to address dysfunctions in cellular processes or Organelles.

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**Course Content**

**UNIT – I: Historical Aspects**

Cell theory, Protoplasm theory, Ultrastructure of virus and bacteria.
Differences between prokaryotic and eukaryotic cells and their characteristics.
Ultrastructure of plant and animal cells.

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# KRISHNA UNIVERSITY

## Machilipatnam, Andhra Pradesh

**UNIT – II: Cell Organelles**

Structure and functions of Endoplasmic Reticulum (Rough and Smooth ER), Golgi apparatus, Lysosomes, Centrioles, Basal bodies, Vacuoles, Ribosomes, and Microbodies (Peroxisomes and Glyoxysomes).
Mitochondria – structure, organization of the respiratory chain, and functions. Chloroplast – structure and function.

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**NIT – III: Nucleus and Cell Cycle**

Structure of the nucleus and the nuclear pore complex, nuclear matrix, and nucleolus.
Organization of genomic DNA, chromosomes, and higher-order chromatin structure.
Cell cycle – functional domains within the nucleus, different phases, and checkpoints in the cell cycle.

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**UNIT – IV: Cell Division and Regulation**

Mitosis, Meiosis, and their regulation.
Apoptosis and its biological importance.
Regulation of cell cycle – Cyclins, MPF, Cyclin-dependent kinases, Growth factors, Nuclear Lamins.
Inhibition of cell cycle progression, MPF and progression to Metaphase, proteolysis, and regulation of MPF activity.

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**UNIT – V: Biomembranes**

Chemical composition of plasma and organelle membranes of animal and plant cells.
Membrane components – lipids, proteins, and carbohydrates; their molecular structure and assembly.
Fluid mosaic model of biological membranes. Micelles and liposomes.

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# KRISHNA UNIVERSITY

## Machilipatnam, Andhra Pradesh

**Blueprint: Program & Semester:** B.Sc. Biochemistry Honours – Semester I
**Course No.:** 2
**Title:** Cell Biology
**Time:** 3 Hours
**Max. Marks:** 70

| Sl. No. | Unit | Short Answer (4M) | Q. No. | Essay (10 M) | Q. No. |
|---|---|---|---|---|---|
| 1 | Unit I | 2 | 1 & 2 | 2 | 9 & 10 |
| 2 | Unit II | 1 | 3 | 2 | 11 & 12 |
| 3 | Unit III | 2 | 4 & 5 | 2 | 13 & 14 |
| 4 | Unit IV | 1 | 6 | 2 | 15 & 16 |
| 5 | Unit V | 2 | 7 & 8 | 2 | 17 &18 |

*Total Marks: 70*

- **Section A**: Any 5 out of 8 questions (Short answers) – 5×4 = 20 Marks
- **Section B**: All 5 questions (Essays with choice) – 5×10 = 50 Marks

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# KRISHNA UNIVERSITY

## Machilipatnam, Andhra Pradesh

**Model Question Paper**

**Program & Semester:** B.Sc. Biochemistry Honours

**Semester**: Ⅰ , **Course No.:** 2

**Title:** Cell Biology

**Time:** 3 Hours **Max. Marks:** 70

**Section – A (Short Answers)**

*(Answer any FIVE questions. Each question carries 4 Marks)* 5×4 = 20 Marks

1. Cell theory
2. Cell wall
3. Ribosomes
4. Nuclear pore complex
5. Functional domains within the nucleus
6. Apoptosis
7. Micelle
8. Liposomes

**Section – B (Essay Questions)**

*(Answer ALL questions)* 5×10 = 50 Marks

9. Discuss the differences between plant and animal cells with labelled diagram.

**OR**

10. Explain the structure and function of a eukaryotic cell.

11. Describe the structure and functions of the endoplasmic reticulum.

**OR**

12. Discuss the structure and organization of the respiratory chain.

13. Describe the organization of genomic DNA and chromatin structure.

**OR**

14 Discuss the different phases of the cell cycle and checkpoints.

15. Explain the different stages of meiosis with a neat labelled diagram.

**OR**

16. Explain MPF activity and its regulation during the cell cycle.

17. Explain the chemical composition and structure of the plasma membrane in animal cells.

**OR**

18. Describe the fluid mosaic model of biological membranes with a neat diagram.

# KRISHNA UNIVERSITY

## Machilipatnam, Andhra Pradesh

### Practical Course

**Program & Semester:** B.Sc. Biochemistry Honours – Semester I
**Course No.:** 2P – Cell Biology

**Total Teaching Hours:** 30 Hours (2 hrs/week – Practical)

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**Course Outcomes**

Students will be able to:

1. Learn about cell structure and cell organelles.
2. Understand the concept of cell division.
3. Acquire knowledge about biological membranes.

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**List of Experiments**

1. Isolation of chloroplast.
2. Isolation of mitochondria from liver.
3. Observation of mitosis in onion root tips.
4. Observation of meiosis in onion flower buds.
5. Visualization of animal and plant cells using methylene blue.
6. Staining and visualization of mitochondria using Janus green stain.

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**Recommended Books**


1. Goldman, Emanuel & Lorrence H. Green (Eds.). *Practical Handbook of Microbiology*. CRC Press, 2015.
2. Dubey, R.C. & Maheshwari, D.K. *Practical Microbiology*. S. Chand, 2002.
3. Cappuccino & Sherman. *Microbiology: A Laboratory Manual*. Pearson Education, 6th Edition.

# KRISHNA UNIVERSITY

## Machilipatnam, Andhra Pradesh

**Program & Semester: B.Sc. Biochemistry (Honours) – Semester II**

**Course No.: 3**

**Title of the Course: GENETICS & MOLECULAR BIOLOGY**

**Total Teaching Hours: 45 Hours (3 Hrs/Week – Theory)**

**Credits: 3**

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## COURSE SYLLABUS

**COURSE SYLLABUS**

**UNIT – I: Principles of Inheritance**

- Mendel's experiments on the garden pea and
- Principles of inheritance
- Deviation from Mendel's laws incomplete dominance
- Chromosomal Theory of Inheritance
- Linkage and Crossing Over
- Chromosomes and Sex Determination

**UNIT – II:**

- Genetic Material and Genome Organization
- Cris-cross inheritance x-linked inheritance
- Human karyotype, amniocentesis
- Chromosomal abnormalities and genetic disorders In humans
- Experiments to prove DNA and RNA as genetic material
- Genome organization in Prokaryotes and Eukaryotes, Histone proteins

**UNIT – III: DNA Replication**

- DNA replication – Proof of semiconservative replication
- Enzymes involved in DNA replication: DNA polymerase I, II and III, Helicases, Topoisomerases, Single strand binding proteins, Primase
- Mechanism of DNA replication – Prokaryotic and Eukaryotic
- Plasmid replication (θ mode of replication), Rolling circle method (M13 Viral replication)
-

**UNIT – IV: Transcription and Post-Transcriptional Modifications**

- Transcription – Basic features of transcription
- Structure of RNA polymerase – Prokaryotic and Eukaryotic
- Concept of promoter – TATA box, –10 and –35 sequences
- Transcription mechanism – Prokaryotic and Eukaryotic
- post-transcriptional modifications in Eukaryotes

**UNIT – V: Translation**

- Translation – Genetic code: Features of the genetic code
- Codon–anticodon interaction – Wobble hypothesis
- Mechanism of translation – Prokaryotic and Eukaryotic: Initiation, Elongation and Termination
- Post translational modifications in eukaryotes

# KRISHNA UNIVERSITY

## Machilipatnam, Andhra Pradesh

**Blueprint: Program & Semester:** B.Sc. Biochemistry Honours – Semester I
**Course No.:** 2
**Title:** Genetics
**Time:** 3 Hours
**Max. Marks:** 70

| Sl. No. | Unit | Short Answer (4M) | Q. No. | Essay (10 M) | Q. No. |
|---|---|---|---|---|---|
| 1 | Unit I | 2 | 1 & 2 | 2 | 9 & 10 |
| 2 | Unit II | 1 | 3 | 2 | 11 & 12 |
| 3 | Unit III | 2 | 4 & 5 | 2 | 13 & 14 |
| 4 | Unit IV | 1 | 6 | 2 | 15 & 16 |
| 5 | Unit V | 2 | 7 & 8 | 2 | 17 &18 |

*Total Marks: 70*

- **Section A**: Any 5 out of 8 questions (Short answers) – 5×4 = 20 Marks
- **Section B**: All 5 questions (Essays with choice) – 5×10 = 50 Marks

# KRISHNA UNIVERSITY

## Machilipatnam, Andhra Pradesh

### MODEL QUESTION PAPER

**Program & Semester: B.Sc. Biochemistry (Honours) – Semester II**

**Course No.: 3**

**Title: GENETICS & MOLECULAR BIOLOGY**

**Time:** 3 Hours **Max. Marks:** 70

## SECTION – A

*(Answer any FIVE questions. Each question carries 4 Marks)*

1. Incomplete dominance and Co-dominance
2. Sex determination
3. Chromosomal abnormalities and genetic disorders In humans
4. Histone proteins
5. Meselson and Stahl experiment
6. Post-transcriptional modifications in Eukaryotes
7. Genetic code
8. Wobble hypothesis

## SECTION – B

*(Answer ALL questions. Each question carries 8 Marks)*

**5× 10= 50 Marks**

9. Discuss about the Mendel's laws of inheritance

**OR**

10. Describe Chromosomal Theory of Inheritance
11. Explain the experiments that proved DNA as genetic material.

**OR**

12. Explain the genome organization in eukaryotes
13. Discuss in detail about the enzymes involved in DNA replication

**OR**

14. Explain about the mechanism of DNA replication
15. Write the mechanism of transcription in prokaryotes

OR

16. Discuss the structure of RNA polymerase and formation of pre-initiation complex
17. Explain the initiation, elongation and termination of prokaryotic translation

**OR**

18. Write a detailed account post translational modifications

# KRISHNA UNIVERSITY

## Machilipatnam, Andhra Pradesh

### PRACTICAL SYLLABUS

**Program & Semester: B.Sc. Biochemistry (Honours) – Semester II**

**Course No.: 2P – GENETICS (Practical)**

**Total Teaching Hours:** 30 Hours (2 Hrs/Week – Practical)

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**Course Outcomes**

After successful completion, students will be able to:

1. Understand DNA and RNA as genetic material.
2. Learn bacterial transformation, transduction, and their application in genetic engineering.
3. Gain knowledge of mutations, mutagen types, and mutant isolation.

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List of Experiments

1. Studying multiple allelism using Blood Group test
2. Observing the Polytene chromosomes
3. Seeing and Genetic Notation in Drosophila
4. Human Chromosome karyotyping
5. Population genetics
6. Extraction of DNA from Fish Fins
7. Isolation of RNA

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**Recommended Books**


1. *Molecular Genetics* – D. Freifelder
2. *Cell Molecular Biology* – Bruce Alberts
3. *Molecular Cloning*, Vol. I–III – Maniatis et al.
4. *Genetics* – Gardner
5. *Molecular Biology of the Gene* – Watson
6. *Genetics* – G. Zubay
7. *Cell and Molecular Biology* – Baltimore
8. *Genes VII* – Benjamin Lewin (2000), Oxford University Press
9. *Cell and Molecular Biology* (2nd Ed., 2002) – P.K. Gupta, Rastogi Publications

# KRISHNA UNIVERSITY

## Machilipatnam, Andhra Pradesh

**Program & Semester: B.Sc. Biochemistry Honours –**

**Semester II Course No.:04**

**Title of the Course:** General Physiology

**Total Teaching Hours: 45 Hours (3 hours/week –**

**Theory) Credits:3**

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**Course Objectives**

1. To impart knowledge about blood composition and function and blood clotting mechanism.
2. To study about the muscular and nervous system.
3. To know about the structure of heart and respiratory system and their functions
3. To appreciate about the components of Urinary system and mechanism of Urine formation
4. To understand the structure and function and different components of Digestive system.

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**Course Outcomes**

**After successful completion of course the students will be able to**

**CO1** – Recognize and analyse blood cells and blood groups and Blood clotting mechanism
**CO2** – Outline the muscular and nervous system, Mechanism of muscle contraction and structure of brain and spinal cord
**CO3** – Acquire knowledge on structure of heart, blood pressure and respiratory system.
**CO4** – Utilize the knowledge about the structure of kidney and nephron, to understand the mechanism Of Urine formation.
**CO5** -- Acquire knowledge about the structure of Digestive system and Digestion process

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**Course Content**

*UNIT-I*

Blood- composition & functions. Types of blood cells, morphology & function - RBC, WBC, platelets. functions of plasma proteins, Blood groups- A B O & Rhesus system, Blood clotting mechanism, anticoagulants

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*UNIT-II*

Muscular system- types of muscles & functions. Mechanism of Muscle Contraction, Structure of brain and spinal cord, Structure of Neuron. Synapses- chemical and electrical synapse, nerve impulse transmission, action potential and neurotransmitters.

*UNIT III*

Cardiovascular and Respiratory System – Structure of heart, cardiac cycle, Blood pressure, Structure of respiratory system, transportation of gases.

*UNIT IV*

Urinary system – Kidney structure and functions. Structure, function of nephron. Mechanism of urine formation- glomerular filtration rate, Constituents of urine.

*UNIT V*

Digestive system -Structure of digestive system, Mechanism of Digestion- Digestion of carbohydrates, lipids, and proteins. Role of hormones and enzymes in digestive process.

**Reference Books**

1. Textbook of Medical Physiology – Guyton & Hall, 11th edition, 2006
2. Davidson's Principles and Practice of Medicine (XX Edition)- John.A.A.Hunter
3. Human Anatomy & Physiology – Elaine N.Marieb, 3rd edition, 1995
4. Essentials of Medical Physiology –Sembulingam, 1999 5. Medical Physiology – Ganong
5. Text book of Medical Biochemistry Physiology – MN.Chatterjee and, Rana Shinde, 7th ed.
6. Animal physiology – Mariakuttikan and Arumugam

# KRISHNA UNIVERSITY

## Machilipatnam, Andhra Pradesh

**PRACTICAL COURSE**
**Title: General Physiology (Practical)**
**Total Teaching Hours: 30 Hours (2 hrs/week – Practical)**

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**Course Objectives**

1. To learn to count RBC and WBC
2. To acquire knowledge on determination of blood groups and ESR
3. To know Hemoglobin estimation

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**Course Outcomes**

After successful completion of course the students will be able to

1. Estimate Hemoglobin
2. Count RBC and WBC
3. Determine blood groups and ESR

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**List of Experiments**

1. RBC count & WBC count
2. Differential leucocyte count by Leishman' s staining
3. Estimation of Hemoglobin by Sahli's acid haematin method
4. Determination of Erythrocyte sedimentation rate
5. Determination of blood group
6. Measurement of blood Pressure

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# KRISHNA UNIVERSITY

## Machilipatnam, Andhra Pradesh

**Blueprint: Program & Semester:** B.Sc. Biochemistry Honours – Semester I
**Course No.:** 2
**Title:** General Physiology
**Time:** 3 Hours
**Max. Marks:** 70

| Sl. No. | Unit | Short Answer (4M) | Q. No. | Essay (10 M) | Q. No. |
|---|---|---|---|---|---|
| 1 | Unit I | 2 | 1 & 2 | 2 | 9 & 10 |
| 2 | Unit II | 1 | 3 | 2 | 11 & 12 |
| 3 | Unit III | 2 | 4 & 5 | 2 | 13 & 14 |
| 4 | Unit IV | 1 | 6 | 2 | 15 & 16 |
| 5 | Unit V | 2 | 7 & 8 | 2 | 17 &18 |

*Total Marks: 70*

- **Section A**: Any 5 out of 8 questions (Short answers) – 5×4 = 20 Marks
- **Section B**: All 5 questions (Essays with choice) – 5×10 = 50 Marks

# KRISHNA UNIVERSITY

## Machilipatnam, Andhra Pradesh

**Model Question Paper**

**Program & Semester:** B.Sc. Biochemistry Honours – Semester II
**Course No.:** 04
**Title of the Course:** General Physiology
**Time:** 3 Hours **Maximum Marks:** 60

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**Part – A (Short Answers)**

Answer any FIVE of the following: 5 × 4 = 20 Marks

1. Blood composition and functions
2. Functions of plasma
3. Action potential
4. Blood pressure.
5. Structure of respiratory system.
6. GFR.
7. Structure of digestive system.
8. Enzymes in digestion

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**Part – B (Essay Questions)**

Answer ALL the following: 5 × 10= 50 Marks

9. Explain the mechanism of clotting of blood.
   **OR**
10. Describe types, morphology and functions of blood cells
11. Explain the structure of neuron and synapse.
    **OR**
12. Discuss types of muscles and their functions.
13. Draw a neat labelled diagram of heart and write about cardiac cycle.
    **OR**
14. Write about transportation of gases.
15. Describe the structure of nephron and mechanism of urine formation.
    **OR**
16. Explain the structure and functions of kidney.
17. Elaborate on the digestion of carbohydrates and the enzymes involved.
    **OR**
18. Discuss the digestion of proteins.