

SRI VENKATESWARA UNIVERSITY - TIRUPATI

PROGRAMME: B.SC. (HONOURS) IN BIOTECHNOLOGY (MAJOR)

W.E.FAY 2023-2024

SEMESTER II

COURSE 3: BIOMOLECULES

Theory

Credits:3

3hrs/week

I. LEARNING OUTCOMES:

Students after successful completion of the course will be able to

1. Gain fundamental knowledge on buffer preparation and significance of carbohydrates
2. Understand the structure of amino acids and functions of proteins.
3. Know the structure of different classes of lipids and their roles in biological systems.
4. Comprehend the structure and functions of nucleic acids
5. Impart knowledge about biological role of vitamins and impact of vitamin deficiency

II. Syllabus:

UNIT -1: Carbohydrates

Concept of molarity, normality, pH, Buffer, buffer preparation. Definition, classification, nomenclature of carbohydrates (α -, β -, D-, L- isomers), structures of monosaccharides, disaccharides and polysaccharides. Biological significance of carbohydrates.

UNIT-2: Amino acids and Proteins

Classification, structure and properties of amino acids. Primary, Secondary, Tertiary & Quaternary structure of proteins. Functions of proteins.

UNIT -3: Nucleic acids

Structure and functions of DNA and RNA. Base composition of nucleic acids, Watson Crick Model (B-DNA), other forms of DNA (A- and Z-DNA) and RNA (m-RNA, r-RNA and t-RNA).

UNIT- 4:Lipids

Types of lipids, structures of saturated and unsaturated fatty acids, triglycerides, phospholipids, glycolipids, Cholesterol.

UNIT – 5: Vitamins and Hormones

Source, structure, biological role and deficiency manifestation of vitamin A, B, C, D, E and K. Hormones- classification and mechanism of action of steroid and protein hormones. Phytohormones and their physiological roles.

SEMESTER II

COURSE 3: BIOMOLECULES

Practical

Credits:1

2hrs/week

III. Skill outcomes:

On successful completion of this course, student will be able to learn the

1. technique of analysis of carbohydrates
2. technique of estimation of amino acids
3. technique of estimation of Nucleic acids
4. technique of estimation of proteins
5. technique of preparation of buffers

IV. Practical syllabus:

1. Qualitative and quantitative estimation of carbohydrates
2. Qualitative estimation of amino acids
3. Quantitative estimation of Nucleic acids
4. Quantitative estimation of proteins
5. Preparation of buffers

V. References:

1. Stryer, L. (2015). Biochemistry. (8th ed.) New York: Freeman.
2. Lehninger, A. L. (2012). Principles of Biochemistry (6th ed.). New York, NY: Worth.
3. Voet, D., & Voet, J. G. (2016). Biochemistry (5th ed.). Hoboken, NJ: J. Wiley & Sons.
4. Dobson, C. M. (2003). Protein Folding and Misfolding. Nature, 426(6968), 884-890. doi:10.1038/nature02261.

MODEL QUESTION PAPER

Max. Marks: 75

Time: 3 hrs

SECTION A

(Total: 5X5=25 Marks)

(Answer any five questions. Each answer carries 5 marks
(At least 1 question should be given from each Unit)

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SECTION B

(Total: 5X10 = 50 Marks)

(Answer any five questions. Each answer carries 10 marks
(At least 1 question should be given from each Unit)

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|-----|---|----|
| 11. | A | or |
| | B | |
| 12. | A | or |
| | B | |
| 13. | A | or |
| | B | |
| 14. | A | or |
| | B | |
| 15. | A | or |
| | B | |

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PROGRAMME: B.SC. (HONOURS) IN BIOTECHNOLOGY (MAJOR)

W.E.FAY 2023-24

SEMESTER II

COURSE 4: ANALYTICAL TOOLS & TECHNIQUES

Theory

Credits:3

3hrs/week

I. Learning outcomes:

Students after successful completion of the course will be able to

1. Impart knowledge about the microscopy techniques.
2. Educate the student to characterize the separated biomolecules by spectroscopic techniques.
3. Gain knowledge on principles and applications of Chromatography and Centrifugation
4. Learn basic principles and types of electrophoresis
5. To familiarize with the concepts and the techniques of Radioactivity

II. Syllabus

UNIT -1: Microscopy

Structure of Light Microscope, working principle and applications of light, phase-contrast, fluorescent and electron Microscopy (SEM and TEM). Comparison between optical and electron microscope, limitations of electron microscopy.

UNIT-2: Spectroscopy

Beer-Lambert law, light absorption and transmission. Extinction coefficient, instrumentation and application of photoelectric colorimeter, and UV-visible spectrophotometer. Basic principles of atomic absorption and NMR spectroscopy.

UNIT -3:Chromatography and Centrifugation

Principles and applications of thin layer, gel-filtration, ion-exchange and affinity chromatography. Concept of HPLC. Basic principles of sedimentation and types of centrifugations. Concept and applications of preparative and analytical centrifugation.

UNIT- 4:Electrophoresis

Basic principles and types of electrophoresis, factors affecting electrophoretic migration. PAGE (Native, SDS-PAGE). Agarose gel electrophoresis. Introduction to 2D & Isoelectric Focusing.

UNIT – 5: Tracer techniques

Stable and radioactive isotopes. Detection and measurement of radioactivity. Applications of radioisotopes in medicine and biological sciences. Autoradiography. Blotting techniques.

SEMESTER II

COURSE 4: ANALYTICAL TOOLS & TECHNIQUES

Practical

Credits:1

2hrs/week

III. Skill outcomes:

The student will be able to learn the

1. technique of using microscope
2. technique of estimation of nucleic acids
3. technique of separation of pigments and amino acids
4. technique of separation of proteins and nucleic acids using electrophoresis
5. technique of separation of sample components using centrifuge

IV. Practical syllabus:

1. Observation of permanent slides under microscope
2. Quantitative estimation of nucleic acids
3. Separation of sample using paper chromatography
4. Separation of nucleic acids by using agarose gel electrophoresis
5. Separation of sample components using centrifuge

V. References:

1. Practical Biochemistry -Principles and Techniques by Keith Wilson and John Walker
2. Biophysical Chemistry - Principles and Techniques by Upadhyay and Upadhyay

MODEL QUESTION PAPER

Max. Marks: 75

Time: 3 hrs

SECTION A

(Total: 5X5=25 Marks)

(Answer any five questions. Each answer carries 5 marks
(At least 1 question should be given from each Unit))

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SECTION B

(Total: 5X10 = 50 Marks)

(Answer any five questions. Each answer carries 10 marks
(At least 1 question should be given from each Unit))

| | | | |
|-----|---|----|--|
| 11. | A | | |
| | B | or | |
| 12. | A | | |
| | B | or | |
| 13. | A | | |
| | B | or | |
| 14. | A | | |
| | B | or | |
| 15. | A | | |
| | B | or | |