

Devi Ahilya Vishwavidhyalaya

B.Sc. Biotechnology

Subject- Biotechnology (as one subject)

15 Marks CCE + 85 Marks End Semester = 100marks each paper

B.Sc. I Year w.e.f. 2014-15

Semester I

Paper I: Biochemistry and Analytical Techniques 85 marks
Practicals 50 marks

Semester II

Paper II: Cell Biology & Metabolism 85 marks
Practicals 50 marks

B.Sc. II Year w.e.f. 2015-16

Semester III

Paper III: Molecular Biology 85 marks
Practicals 50 marks

Semester IV

Paper IV: Microbial Biotechnology 85 marks
Practicals 50 marks

B.Sc. III Year w.e.f. 2016-17

Semester V

Paper V: Immunology and Animal Biotechnology 85 marks
Practicals 50 marks

Semester VI

Paper I: Plant and Environmental Biotechnology 50 marks
Practicals 50 marks
Internship 100 marks

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B.Sc. I YEAR (BIOTECHNOLOGY)

Semester I

Paper I: Biochemistry and Analytical Techniques

Maximum Marks: 85

Unit I

Carbohydrates: Introduction and biological importance. Structure and properties of reducing sugars, Isomerism in monosaccharides; aldose-ketose, optical isomers, stereoisomers, D & L forms, epimers, anomers, Mutarotation –open and ring structures. concept of reducing and non reducing sugars), Disaccharide (maltose, sucrose, lactose), Oligosaccharide (raffinose) and Polysaccharide (starch, amylose and amylopectin, glycogen, peptidoglycan, cellulose, proteoglycan matrix).

Lipids: Introduction, Classes, Fatty acids [saturated, unsaturated, branched, essential fatty acids, Physical properties, Chemical properties, Saponification value, acid value, iodine number, rancidity]. Structure and function of phospholipids, Sphingolipids, lipoproteins and cholesterol.

Unit II

Amino acids: Structural and nutritional classification, properties of amino acids. Acid base behavior, Zwitterions, isoelectric pH, Color reaction of amino acids.

Protein structure: Peptide bond, outline of primary, secondary, tertiary and quaternary structure of proteins and their examples. Structural and functional proteins. Forces stabilizing secondary, tertiary and quaternary structure with examples.

Unit III

Enzymes: Outlines of enzyme classification. Active site, energy of activation, transition state hypothesis, lock and key hypothesis, induced fit hypothesis. Concept of K_m , Michaelis Menten equation. Enzyme activation, various types of enzyme inhibition and identification using double reciprocal plot. Introduction to Allosteric enzymes.

Definition of holoenzyme, apoenzyme, coenzyme, cofactor, prosthetic group and their examples. Concept of ribozyme, multiple forms, isozymes and abzymes.

Chemical composition of nucleotides, Watson Crick model of DNA structure. Types of DNA (A, B, Z: their structure and occurrence) and RNA (hn RNA, m RNA, r RNA, t RNA).

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Unit IV

Light Microscopy (Bright field, dark field, fluorescence & Phase contrast) and Electron microscopy (TEM & SEM). Colorimetry and UV- Visible Spectrophotometry,

Electrophoresis Techniques and applications: PAGE (native and denature) and Agarose gel electrophoresis.

Unit V

Concept, types and applications of Chromatography; Paper chromatography, Thin layer chromatography, Gel filtration chromatography, Ion exchange chromatography, Affinity chromatography.

List of Experiments

1. Principles and working knowledge of instruments like Colorimeter, pH meter, Centrifuge, Spectrophotometer, Microscope etc.
2. Qualitative analysis of Carbohydrates, Proteins and Lipids.
3. Quantitative estimation of Protein by Folin-Lowry unitary method.
4. Quantitative estimation of sugar by Nelson Somogyi's unitary method.
5. Analyzing the enzyme activity.
6. Study the effect of pH on enzyme activity.
7. Study the effect of temperature on enzyme activity.
8. Separation of aminoacids by TLC
9. Separation of leaf pigments by Paper chromatography
10. Isolation of potato starch and observation under microscope.

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Scheme of Practical Examination

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| 1. Quantitative analysis of by Proteins /Carbohydrates by unitary method | (12) |
| 2. Qualitative detection of carbohydrates, proteins and lipids. . | (10) |
| 3. Study the effect of pH/temperature on enzyme activity. | (10) |
| 4. Spotting | (08) |
| 5. Viva- Voce | (05) |
| 6. Practical Record | (05) |

RECOMMENDED BOOKS

1. Principles of Biochemistry, Author- Lehninger
2. Fundamentals of Biochemistry, Author- J. L. Jain
3. Biochemistry, Author- Voet and Voet.
4. Textbook of Biochemistry- S.P. Singh.
5. Biochemistry, Author- Stryer.
6. Introduction to protein structure, Authors- Branden and Tooze.
7. Principles of Biochemistry, Authors – Zubey, Parson and Vance.
8. Experiments in Biotechnology, Nighojkar and Nighojkar.

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B.Sc. I YEAR (BIOTECHNOLOGY)

Semester II

Paper II: Cell Biology & Metabolism

Maximum Marks: 85

Unit I

Discovery of Cell and Cell Theory; Comparison of prokaryotic and eukaryotic cells, plant and animal cell. Cell division and Cell cycle. Anomalies in Cell Division and associated diseases.

Unit II

Cell synchrony and its applications. Cell-cell interactions. Cell Signaling. Cell locomotion. Cell senescence and death. Cell differentiation.

Unit III

Chemical components of a cell. Structure and function of prokaryotic and eukaryotic cell, Cell wall and Plasma membrane Modification of plasma membrane and intracellular junctions; Cytoskeleton; Protoplasm; Mitochondria; Chloroplast; ER; Golgi complex; Lysosome, Endosome and Microbodies; Ribosome; Centriole; Nucleus.

Unit IV

Carbohydrate Metabolism – Aerobic & Anaerobic glycolysis, sequence of reactions in glycolysis, regulation in glycolysis, citric acid cycle (amphibolic pathway), glycogenesis, glycogenolysis, Pentose-phosphate pathway, Oxidative Phosphorylation and ETC.

Unit V

Amino acid Metabolism – Amino acid breakdown (transamination, deamination, Urea cycle) diseases associated with defects in amino acid metabolism.

Lipid Metabolism – beta oxidation of saturated fatty acids, oxidation of unsaturated fatty acids, oxidation of odd chain fatty acids, energy yield, ketone bodies.

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List of Experiments

- 1 To study the plant cell and animal cell structure.
- 2 To study microbial cell by Monochrome staining and Gram staining.
- 3 Study the different stages of mitosis and meiosis.
4. Prepare slide for study of stomata.
- 5 Study of permanent slides like cell division, prokaryotic and eukaryotic cells, Muscles and Nerve cells, T.S. of stomatal cells
- 6 To study the animal cell structure using cheek cells.
7. Permanent slide preparation
- 8 Histochemical localization of lignin.
- 9 Observe various stages of mitosis in onion root tip.

Scheme of Practical Examination

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| 1. Observe different stages of mitosis in the given sample. | 12 |
| 2. Perform Gram staining of given bacterial culture. | 10 |
| 3. Study of plant/animal cell structure. | 10 |
| 4. Spotting | 08 |
| 5. Viva. | 05 |
| 6. Practical Record. | 05 |

RECOMMENDED BOOKS

1. Molecular biology of the cell, Alberts.
2. Molecular cell biology, Lodish Scientific American Books, Inc.
3. Cell in Development and Inheritance, EB Wilson.
4. Cell Biology, P.S. Verma and Agrawal.
5. Experiments in Biotechnology, Nighojkar and Nighojkar.

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