SILVER OAK UNIVERSITY

EDUCATION TO INNOVATION

(Established under Gujarat Private Universities Act, 2009)

SEMESTER – III

Molecular Structure of Microorganisms
Microbial control
Enzymology
Biochemistry

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Subject: - Molecular Structure of Microorganisms								
Program: B.Sc.				Subject Code:			Semester: III	
Teaching Scheme				Examination Evaluation Scheme				
Lecture	Tutorial	Practical	Credits	University Theory Examination	University Practical Examination	Continuous Internal Evaluation (CIE)- Theory	Continuous Internal Evaluation (CIE)- Practical	Total
04	-	4	6	24/60	20/50	16/40	-	150

THEORY

Unit: 1 Biochemistry

a. Structure of atom and Elements of Living organisms
b. Molecules and chemical bonds
c. Different chemical reactions in living system
d. Bio molecules of living system

Unit:2 Carbohydrates and nucleic acids

a. Definition, General structure and Classification of Carbohydrates
b. Biological importance of Carbohydrates
c. General structure of nucleic acids (DNA ,RNA) and nucleotides, Functions of nucleotides

Unit: 3 Amino acids and proteins

a. Functions and Composition of proteins
b. Amino acids Structure of Proteins
c. Properties of Proteins and Classification of Proteins
d. Biologically important peptides

Unit: 4 Lipids and fatty acids

a. Classification & Functions of Lipids
b. Fatty acids Essential Fatty acids
c. Triacylglycerols Phospholipids
d. Glycolipids and Lipoproteins

e. Steroids
f. Amphipathic lipids & Soaps and detergents

PRACTICALS

1. Qualitative analysis of carbohydrates
2. Qualitative analysis of proteins

REFERERENCE BOOKS

- Principles of Microbiology.Atlas, R.M..WcBrown
- Harper—s Biochemistry-Rober K. Murray, Daryl K. Grammer, McGraw Hill, Lange MedicalBooks. 25th edition.
- Fundamentals of Biochemistry-J.L. Jain, Sunjay Jain, Nitin Jain, S. Chand &Company.
- Biochemistry-Dr. Amit Krishna De, S. Chand & Co., Ltd.
- Biochemistry-Dr. Ambika Shanmugam, Published by Author.
- Biomolecules-C. Kannan , MJP Publishers,Chennai-5.
- Microbiology - an introduction,8th Tortora, Funke & Pearson
- Outline of Biochemistry Conn, Stumpf,Breuning, Dci.John Wiley &Sons.
- Principles of Biochemistry,2nd Lehninger, Nelson & Cox CBS, New Delhi
- Fundamental Principles of Bacteriology A.J. Sale Tata McGraw Hill

- U. Satyanarayana & U. Chakrapani (2006). *Biochemistry* 3rd Revised Edition

- Conn, E. E., & Stumpf, P. K. (1987). *Outlines of Biochemistry,* 5th Edition.

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Subject: - Microbial Control								
Program: B.Sc.				Subject Code:			Semester: III	
Teaching Scheme				Examination Evaluation Scheme				
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Unit: 1 physical methods of microbial control (8hrs)

a. Principle of Microbial Control
b. Heat
c. Low Temperature
d. Filtration
e. Radiation
f. Desiccation and Freeze Drying
g. Osmotic Pressure

Unit:2 Chemical methods for control of microorganisms (8hrs)

a. Chemical agents of control: Ideal antimicrobial chemical agent and its characteristics.
b. Major groups of antimicrobial chemical agents
c. Phenol Alcohols, Aldehydes, Halogens, Heavy metals, Dyes, Quarter nary ammonium compounds, Gaseous agents.
d. Evaluation of Antimicrobial agent: Use of tube dilution, Agar plate methods, Phenol coefficient test
e. Alcohols
f. Hydrogen Peroxide
g. Heavy Metals and their Compounds
h. Aldehydes
i. Quaternary Ammonium Compounds
j. Gaseous Sterilants and Disinfectants

Unit: 3 Chemotherapy (8hrs)

a. Principles of Chemotherapy
b. Historical development of chemotherapy: Paul Ehrlich, S.Waxman, A.Fleming,
c. Types of Chemotherapeutic agents and general mode of action: Cell wall, Protein, Cell membrane and Enzymes
d. New Generation antibiotics

Unit: 4 Chemotherapeutic agents (7 hrs)

a. Antibiotics and synthetic drugs, antibiotics and their mode of action: Penicillin,and Streptomycin,antifungal,antiviral agents.
b. Sulfonamides' s mode of action.
c. Antibiotic resistance development
d. Assay of antibiotics.
e. Non-medical uses of antibiotics.

PRACTICALS

1. Action of antiseptics and disinfectants on bacteria.
2. Evaluation of disinfectant by Phenol coefficient method.
3. Lethal action of U.V. rays on bacteria
4. Lethal action of heavy metals on bacteria
5. Study of sensitivity spectrum of antibiotic against the test organismby use of paper disc method
6. Determination of spectrum of activity of an antibiotic by use of agar ditch method
7. Find out the MBC of given antibiotic

REFERENCE BOOKS

- Microbiology, Pelczar, M.J. Chan, E.C.S.,Kreig N.R.: Mc Graw Hill Book Company
- General Microbiology, Stainer R.Y., Ingraham Wheelis, M.L.Painter, P.R. Mac Millan India.
- Introduction to Microbiology by J.L. Ingraham and C.A. Ingraham, 2000
- Microbiology by J,G Black, 2002
- Elementary Microbiology (Vol-I) Fundamentals of microbiology)

- Dr. H.A.Modi; (Aug 1995) AKTA Prakashan, Nadiad-387001
- Wiley, J., & Sherwood, L. (2015). *Prescott, Harley, and Klein's Microbiology*, 9th Ed., McGraw-Hill Science/Engineering/Math, ISBN: 9780073402406
- Wiley, J., & Sherwood, L. (2013). *Prescott, Harley, and Klein's Microbiology*, 8th Ed., McGraw-Hill Science/Engineering/Math, ISBN: 9780071313674

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Subject: - Enzymology								
Program: B.Sc.				**Subject Code:**			**Semester: III**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
04	-	4	6	24/60	20/50	16/40	-	150

THEORY

Unit: 1 Nomenclature and classification of enzyme

a. Historical background
b. Nomenclature and classification
c. Isoenzymes
d. Coenzymes

Unit: 2 Characteristics of enzyme

a. Chemical nature and characteristics of enzymes
b. Factors affecting enzyme activity
c. Enzyme specificity
d. Units of enzyme activity

Unit: 3 Mechanism of enzymatic action

a. Mechanism of enzyme action
b. Active site MM equation, LB plot, *Vmax & Km*
c. Enzyme inhibition

Unit: 4 Regulation and purification

a. Regulation of enzyme activity in living system
b. Purification of enzymes

c. Biological role of enzymes

PRACTICAL

1. Study of extracellular enzymatic activity: Amylase, Caseinase, Gelatinase, Lipase, DNAase
2. Study of intracellular enzymatic activity: Deaminase, Ornithine Decarboxylase, Catalase, Dehydrogenase (Resazurin indicator), Oxidase.
3. Effect of pH on enzyme activity (4,7,9)
4. Effect of Temp. On enzyme activity (0 °C, 15 °C ,30 °C ,45 °C ,60°C)

References

- Satyanarayan U. and Chakrapani U., (2013), Biochemistry, 4th ed., Upala Autor-Publisher Interlinks. ISBN: 9788187134800
- Jain J. L. and Jain N., (2006), Fundamentals of Biochemistry, 6th ed., S. Chand Publications. ISBN: 9788121924535
- Berg and Stryer, (2015) Biochemistry, 8th edition. W H Freeman pub.
- Voet and Voet, (2010) Fundamentals of biochemistry, 4th edition**,** Johns wiley & sons, Asia .

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Subject: - Biochemistry								
Program: B.Sc.				**Subject Code:**			**Semester: III**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
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THEORY

Unit 1: Basic characteristics of small molecules

Water as solvent for molecules in cell; Bonding: bond angles and lengths; Asymmetry in molecules; Conformations of molecules; Tautomerism and resonance; Forces between molecules and chemical groups; Acids and Bases: Titration curves; pH, its measurement and significance in biological systems; Buffers; Henderson – Hasselbach Equation; Buffering against pH changes in biological systems.

Unit 2: Carbohydrates and Glycobiology

Monosaccharides and Disaccharides: Structures, characteristics, functions and sources; Polysaccharides: Structure and influence of steric factors and hydrogen bonding; Examples of Homo and heteropolysaccharides and their functions in relation to the structures e.g. Starch, cellulose, Glycogen, Pectin, Hemicelluloses etc.; Glycoconjugates: Proteoglycans, Glycoproteins and Glycolipids; Carbohydrates as informational Molecules: Lectin – carbohydrate Interactions.

Unit 3: Amino Acids and Proteins

Structures and classification of amino acids; Uncommon amino acids; Amino acids as acids and bases – titration curves and its ampholytic nature; Peptide bond and its characteristics; Peptides and their ionization behavior; Structure of proteins: Primary structure, Secondary structure, Tertiary structure and Quaternary structure; Amino acid sequencing of proteins and its significance; Use of X – ray crystallography and Mass spectrometry in investigating proteins; Protein denaturation and Folding; Protein functions – Transport: Structure and function relationship of myoglobin and hemoglobin; Complementary interactions between proteins and ligands, e.g. Antigen – antibody interaction,

Unit 4: Lipids and Nucleic Acids

Storage lipids: Structure, characteristics and functions of Fatty Acids, Triacylglycerols; Structural Lipids: Glycerophospholipids, Galactolipids and Sulpholipids, Sphingolipids and Sterols; Lipids as signal molecules; Lipids as cofactors; Lipids as pigments; Lipid extraction methods; Determination of lipid structures; Introduction to lipidomics.

Structures, characteristics and functions of nucleotides; Three dimensional structure of nucleic acids; DNA as a double helical structure; Unusual nucleotides and unusual structures of nucleic acids

PRACTICAL

BASIC CHEMISTRY OF BIOMOLECULES

1. Tests for identification of sugars and sugar mixtures
2. Colour reactions for amino acids and peptides
3. Colour reactions of cholesterol
4. Lipid extraction method
5. Determination of iodine number
6. Determination of saponification number
7. Colorimetric estimation of DNA by DPA method
8. Colorimetric estimation of RNA by Orcinol method
9. Colorimetric estimation of Sugar by DNSA method

References:

1. Biochemistry, 5th Edition. Garrett and Grisham
2. Biochemistry, 3rd Edition. Matthews, van Holde, and Ahern
3. Biochemistry, 6th Edition. Berg, Tymoczko and Stryer
4. Molecular Cell Biology, 7th Edition. Lodish, et. al.

5. Textbook of Biochemistry with Clinical Correlations, 7th Edition by T. Devlin
6. Biochemistry, 4th edition. Donald Voet and Voet J
7. Harpers review of Biochemistry, 25th Edition. Murray RK, Rodwell VW.
8. Lehninger's Principles of Biochemistry, 5th Edition. Nelson DL and Cox MM
9. Concepts in Biochemistry, 3rd Edition. Rodney Boyer
10. http://en.wikibooks.org/wiki/Biochemistry
11. Introduction to Practical Biochemistry. T. Plummer.