

**SARDAR PATEL UNIVERSITY**  
**BSc Biotechnology; VI semester**  
**US06CBIT21: Molecular Communications**  
**(4 CREDITS, 4 HOURS, 70 MARKS)**  
**(Effective from June 2020)**

Unit-I: Fluid mosaic model of membrane. Functions of plasma membrane. Chemical composition of membrane—Types & functions of lipids, proteins and carbohydrate. Membrane fluidity. Membrane transport and cell junctions.

Unit II--Cytoskeleton- composition and function—Polymerization, depolymerization of Microtubules, intermediate filaments and microfilaments, associated proteins, Functions and significance. Molecular motors (dynein kinesin and myosin).concept of sarcomere and muscle contraction and relaxation. Introduction to rigor mortis.

Unit-III: Cell signaling—basic characteristics of cell signaling & significance, second messenger(C- AMP,ATP/GTP), structure and role of G protein coupled receptors (GPCR) & Receptor tyrosine kinases (RTK) in signaling pathway.

Unit-IV: Hormones- Introduction, chemical nature and types ( peptides, steroids, amines and fatty acids) mechanism of action of hormones. Plant hormones --types ((auxin, cytokinin, GA, ABA ,ethylene) and their roles in plant growth.

Reference Books:

Human physiology by Chaterjee and Chaterjee  
Human physiology by Tortora  
Biochemistry by Zubay; Biochemistry by Stryer  
Text book of biochemistry- Vasudevan & Shreekumari  
Biochemistry -Lehninger

**Learning outcome: Students will know about the structures and working of molecules involved in sensing and responding to signals (external/internal) and to communicate with other parts of body for proper functioning of organisms.**

**SARDAR PATEL UNIVERSITY**  
**BSc Biotechnology; VI semester**  
**US06CBIT22: INDUSTRIAL BIOTECHNOLOGY**  
**(4 CREDITS, 4 HOURS, 70 MARKS)**  
**(Effective from June 2020)**

**Unit-I--**A brief introduction fermentor or bioreactors. Structural component of typical fermentor. Introduction to aeration and agitation and their effect,  $C_{crit}$  and  $KL_a$ , pH and temperature on fermentation, Instrumentation for control of process (Temperature and pH electrodes), Downstream processing- methods and application.

**Unit- II--**Typical fermentation process (ethanol production , organic acid, vinegar, Red and white wine, sparkling wine, champagne. Production of beer, Overview for spoilage of wine. Production of enzymes and antibiotics through fermentation. Introduction to food Spoilage and their preservation.

**Unit-III-** Microbiology of waste water treatment, aerobic process - activated sludge, oxidation ponds, trickling filter, rotating discs, rotating drums, oxidation ditch. Anaerobic process - anaerobic digestion, anaerobic filters. Treatment schemes for waste waters of dairy and tannery industries

**Unit-IV---**Biotechnology: risks & ethics. Biosafety : guidelines and regulations, intellectual property rights ( IPR) and protection. Forms of protection –patents- introduction, process and patenting strategies, significance of patent, Patenting of biological materials. patenting status in India. A brief overview for copy rights, trade secrets and trade marks. Plant variety protection; World intellectual property organization (WIPO) general agreement of tariffs and trade (GATT) and trade related IPR (TRIPS).

Reference books

Environmental pollution control engineering-C S Rao

Industrial microbiology-Whitaker

Industrial microbiology-A H Patel

General microbiology- Frobisher

A text book of biotechnology – R C Dubey

**Learning outcome: This paper will make clear the understanding of students about fermentation process and its applications. students will be aware of the IPR, and copyrights also.**

**SARDAR PATEL UNIVERSITY**  
**BSc Biotechnology; VI semester**  
**US06CBIT23: METABOLISM**  
**(4 CREDITS, 4 HOURS, 70 MARKS)**  
**Semester -V (Effective from June 2020)**

**UNIT--I:** Photosynthesis dark reaction: Calvin cycle, regulation, Photo respiration, C<sub>4</sub> and CAM pathways in plants. Oxidative phosphorylation, The electron transport chain - its organization and function. Peter Mitchell's chemiosmotic hypothesis and Proton motive force. FoF<sub>1</sub> ATP synthase, structure and mechanism of ATP synthesis. Glyoxylate cycle in plant.

**UNIT-II** Glycolysis: overview, reactions, regulations, Pentose phosphate pathway and its importance, Citric acid cycle, Malate aspartate shuttle, Glyceraldehyde-3-phosphate dehydrogenase shuttle,. Glycogen synthesis, glycogen breakdown, gluconeogenesis.

**Unit -III-** Fatty acid synthesis--FAS complex enzyme. Synthesis of saturated, unsaturated, odd and even chain fatty acids. Fatty acid oxidation:  $\beta$  oxidation of saturated, unsaturated, odd and even numbered and branched chain fatty acids, regulation of fatty acid oxidation, Ketone-body metabolism.

**Unit IV-** Nucleotide biosynthesis. De novo and salvage pathway. Digestion and absorption of dietary proteins. Role of essential and non-essential amino acids in growth and development. Transamination, role of pyridoxal phosphate, glucose-alanine cycle, urea cycle.

Reference books:

Biochemistry by Zubay;

Biochemistry by Stryer

Text book of biochemistry- Vasudevan & Shreekumari

Biochemistry -Lehninger

**Learning outcome: Students will get an understanding of how living organisms get energy at molecular level through metabolic activities.**

**SARDAR PATEL UNIVERSITY**  
**BSc Biotechnology; VI semester**  
**US06CBIT24: ENZYMOLOGY**  
**(4 CREDITS, 4 HOURS, 70 MARKS)**  
**(Effective from June 2020)**

**Unit-I:** Enzymology—General characteristics and classification, definition of holoenzymes, coenzymes, apoenzymes, cofactors, activators, inhibitors, units of enzyme activity, isoenzymes, turn over number, specific activity, first order and zero order reactions. Structure of active site of enzymes, specificity of enzyme action- Types and factors affecting enzyme activity. Brief introduction of allosteric enzymes.

**Unit-II:** Mechanism of action of enzymes--General features - proximity and orientation, strain and distortion, acid-base and covalent catalysis (chymotrypsin, lysozyme). Metal activated enzymes and metalloenzymes, transition state analogues. Coenzymes in enzyme catalyzed reactions. Structure, vitamin precursors, types of reaction involved in: TPP, FAD, NAD, pyridoxal phosphate, biotin, coenzyme A, tetrahydrofolate and lipoic acid.

**Unit III:** Enzyme kinetics—Derivation of Michaelis and Menten equation and its modifications (Line weaver & Burk plot, Eadie- Hofstee and Hannes & Woolf plots). Enzyme Inhibition - competitive, non competitive, uncompetitive, mixed & substrate inhibition

**Unit IV:** Applications of Enzymes-- Enzymes as reagents (glucose oxidase, cholesterol oxidase); Marker enzymes in diagnostics (SGPT, SGOT, creatine kinase); Introduction to immobilization and its applications. Industrial applications of enzyme-amylase, protease and lipases(food, textile & detergent)

Reference books:

Enzymology by Palmer;

Fundamentals of Enzymology – Nicolas Price & Lewis Stevens

Biochemistry by Zubay;

Biochemistry by Stryer ;

Text book of biochemistry- Vasudevan & Shreekumari;

Biochemistry -Lehninger

**Learning outcome: Through this paper students will learn the catalytic control of biochemical reactions and how these catalytic proteins can make a significant role in our day to day work also.**

**SARDAR PATEL UNIVERSITY**  
**BSc Biotechnology; VI semester**  
**US06CBIT025: PRACTICAL**  
**(6 CREDITS, 12 HOURS, 150 MARKS)**  
**(Effective from June 2020)**

1. Estimation of Gluconic acid
2. Estimation of Alcohol
3. Estimation of Penicillin
4. Water analysis
5. Determination of Dissolved oxygen(DO) of waste water
6. Determination of COD of waste water
7. Determination of  $K_M$  &  $V_{Max}$  of amylase.
8. effect of pH/ Temperature/ Incubation time on amylase activity
9. Estimation of SGPT/SGOT/ Creatine kinase
10. Immobilization of yeast cells by calcium alginate
11. Estimation of cellulase activity by CMC & Filter paper.
12. Food analysis
13. Effect of Hormones on seed germination (Auxin, G.A, Cytokinin)
14. Antibiotic sensitivity by Bioassay (Cup- borer)
15. Effect of antimicrobial agent on the growth of microorganisms
16. Oligodynamic action of heavy metal (copper) on the growth of microorganisms

**SARDAR PATEL UNIVERSITY**  
**BSc Biotechnology; VI semester**  
**US06DBIT26: Discipline specific VIROLOGY**  
**(4 CREDITS, 4 HOURS, 70 MARKS)**  
**(Effective from June 2020)**

Unit I: History of viruses. Classification of viruses. characteristic features of viruses. General structure (nucleic acids, capsids, envelope) of viruses. Structure of Bacteriophage and TMV. Multiplication, movement, symptoms, transmission and control measures of plant viruses. Introduction to viroids.

Unit-II: Assay of viruses -physical counts, Hemagglutination, plaque assay, pock method, end point method. Multiplication of bacterial viruses--lytic cycle -one step growth, lysogeny -establishment of lysogenic state(Prophage cycle), and significance of lysogeny.

Unit-III: Animal viruses- structure and multiplication of adenovirus, Hepatitis A,B,C & E virus, vaccinia virus, Reovirus and HIV. Introduction to Prions.

Unit IV: Vaccine its types (DNA vaccine bacterial vaccine recombinant vaccine and its development. Principles of vaccination--passive and active immunization. Immunization programmes & role in WHO.

Reference books

Genetics of viruses and bacteria- Hayes;  
Microbiology-Davis  
An introduction to viruses- Biswas & Biswas  
Plant viruses- A D Singh  
Genes---Benjamin Lewin

**Learning outcome: Students will be able to understand the nature and pathogenicity of viruses in different living organisms and the means to control them.**