

SARDAR PATEL UNIVERSITY

BSc Biotechnology Programme Outcomes

- After successful completion of B.Sc Biotechnology Course the graduates
- Eligible for pursuing higher education, M.Sc. programmes in the different field of life science.
- Eligible for doing jobs in pharmaceutical and biotechnological Industry.
- Understand the potentials, and impact of biotechnological outcome on environment and to find out the sustainable solutions to problems regarding environment, medical, agriculture sector, etc.
- Can work individually as well as in team to thrive in multidisciplinary environment.
- Both oral and written communication skills

SARDAR PATEL UNIVERSITY
BSc Biotechnology; V semester
US05CBIT21: Molecular Biology & Genetics
(4 PERIODS, 4 HOURS, 70 MARKS)
(Effective from June 2020)

Unit-I: Eukaryotic genome organization. Chromosome structure, types and banding (G,C,Q,R,T)- Nucleosome, chromatin, DNA binding proteins Histones & Non-histones DNA protein interaction. Types of binding motifs – Zinc finger motifs, leucine zipper, helix loop helix, helix turn helix.

Unit-II: Replication in eukaryotes – replication Enzymes & proteins involved in replication with its function. Mitochondrial DNA replication. DNA- damage & repair, mismatch repair, direct repair, excision repair, SOS repair and post replicative repair.

Unit-III: Transcription in Eukaryote: Types of RNA polymerase, types of promoter, enhancers & silencers, initiation, elongation, termination, post transcriptional modification – types of intron, splicing of m-RNA, t-RNA, modification of 5'-3' ends. Translation in eukaryote, post-translational modification.

Unit-IV :Recombination- site specific and homologous, (Holliday model). Role of rec genes and protein. Mobile genetic element prokaryotic-IS and Composite and eukaryotic-Ac/DS element. Retrotransposon- properties , types – LTR and NON LTR. Significance of retrotransposon in eukaryotes.

Reference Books

Genes—Benjamin Lewin

Molecular biology of the gene-Watson et al

Molecular biology of the cell- Alberts et al

Learning outcome: Students will be understanding the genetic material and its mechanism to copy, and decode the information at molecular level.

SARDAR PATEL UNIVERSITY
BSc Biotechnology; V semester
US05CBIT22: Transgenics
(4 CREDITS, 4 HOURS, 70 MARKS)
(Effective from June 2020)

Unit-I---Transgenic technology-Strategy. Gene transfer methods -physical(microinjection, electroporation, gene gun) chemical (liposome,PEG Ca co precipitation)& vector mediated(Ti-plasmid and retrovirus), screening of transgenics- Reporter genes (selectable & scorable markers). Advances of transgenic technology, strategy for gene inhibition.

Unit-II--Transgenic technology--introduction to functional genomics(microarray). Human genome project –objective, process and significance. Molecular marker-introduction, properties of ideal molecular markers. Types of molecular markers for analysis of genomes – RFLP, RAPD, AFLP, EST, SNPs, Mini and microsatellite.

Unit III-Agricultural biotechnology- Introduction and scope. Development of insect resistant(Bt-crop) and herbicide resistant (glufosinate) plants and the improvement of nutritional value in plants (golden rice, flavor savor tomato). Cryopreservation storage and importance of germplasm. A brief introduction to edible vaccine.

Unit-IV--Transformation and Evolution of continuous cell line. Hybridoma technology - introduction and steps for construction of Hybridoma cell lines. Screening of Hybridoma cell lines. Methods for production of monoclonal antibodies through hybridoma cell lines and Genetic engineering. Introduction to transgenic animals-process to create transgenic animals and their application (mice).Introduction to nuclear transfer technology (Dolly sheep), Process to create knock out mice and its significance.

Reference Books:

Plant Biotechnology- P K Gupta

Animal cell culture- Freshney

Gene manipulation – G.B. Old & Primrose

Molecular Biotechnology – Glick & Galston

Genetics-- Clug & Cummings

Gene Cloning by T.A. Brown.

Learning outcome:

Students would be able to understand the mechanism behind genetic modification of plants and animals for their improvement.

SARDAR PATEL UNIVERSITY
BSc Biotechnology; V semester
US05CBIT23: R-DNA TECHNOLOGY
(4 CREDITS, 4 HOURS, 70 MARKS)
(Effective from June 2020)

Unit-I: Recombinant DNA technology---Introduction and steps involved, restriction enzymes, nucleic acid modifying enzymes-klenow fragment of DNA pol-I, alkaline phosphatase, polynucleotide kinase, reverse transcriptase, DNA ligase, DNase-1, RNase, methylase, exonuclease.

Unit-II: Prokaryotic cloning and expression vectors- Bacteriophage- λ vectors- replacement & insertional vectors cosmid, phagemid. BAC. Cloning and expression vectors- Bacteriophage- λ vectors- replacement & insertional vectors cosmid, phagemid. BAc, yeast vectors- yEP, yIP, yCP, eukaryotic vectors- SV-40, retroviral vector, MAC; plasmid based vectors- co-integrate & binary vectors.

Unit III: Eukaryotic cloning and expression vectors-yeast vectors-YEP, YIP, YCP, SV-40, retroviral vector, MAC; plasmid based vectors- co-integrate & binary vectors. Introduction into eukaryotic expression system.

Unit-IV: Introduction to Bioinformatics. Significance of Bioinformatics in Biological Science- Biological Databases (Accession codes & identifications) Examples of Biological Database (A) Nucleotide sequence Databases (B) Protein sequence databases (EMBL, Gene Bank). Primary Nucleotide sequence, databases, protein sequences, databases).

Reference books:

From genes to clones-Ernst winnaker
Genetic engineering-Old & Primrose;
Biotechnology and genomics-P K Gupta
Genes and cloning – T A Brown
A text book of biotechnology- R C Dubey

Learning outcome: Students would be able to understand how DNA molecules from different sources can be made to combine and transfer from one organism to other. Students will also learn to use computer as a tool for applying his knowledge of biotechnology.

SARDAR PATEL UNIVERSITY
BSc Biotechnology; V semester
US05CBIT24-- IMMUNOLOGY
(4 CREDITS, 4 HOURS, 70 MARKS)
(Effective from June 2020)

UNIT-I Introduction to immune system, types of immunity (innate and acquired, active and passive, humoral and cell-mediated). Immune response-primary and secondary. Antigen-Definition, properties and classification, epitopes and haptens, Antibody- Definition, structure, type and function, blood groups types (ABO and Rh system).

Unit-II: Antigen – Antibody interactions – Agglutination, precipitations, immunodiffusion, ELISA- Introduction, principle and types. B and T lymphocytes, Cytokines (IL-2, TNF- α and β , chemokines and Interferons) introduction and role of cytokines in immune response.

Unit III: complement system- function, components and activation of different pathways. Immunodeficiency- primary and secondary. Major Histocompatibility complex-structure, types, and functions. Hyper sensitivity Autoimmunity – Introduction and types.

UNIT-IV : Apoptosis: Regulation and control of apoptosis. Caspases, Activation of Apoptotic pathways by internal and external stimuli. Cell mediated immunity – NK cells mechanism of Action & importance. Cancer- Introduction, Types, Mechanism, Concept of Protooncogenes and oncogenes.

Reference books

Genes –Levin;

Essential Immunology-Roit

Immunology- Kuby

Molecular biology of the gene- Watson

Learning outcome: Students would be able to acquire the knowledge of our body's defense system--immune system and its functioning in fighting against diseases.

SARDAR PATEL UNIVERSITY
BSc Biotechnology; V semester
US05CBIT025: PRACTICAL
(6 CREDITS, 12 HOURS, 150 MARKS)
(Effective from June 2020)

1. isolation of DNA from Fungi
2. isolation of RNA from plant.
3. Separation of DNA (Chromosomal & Plasmid) by Agarose gel electrophoresis
4. Chromosome banding (G banding)
5. Separation of Proteins by SDS PAGE
6. PCR
7. isolation of antibiotic resistant microorganisms by replica plating
8. effect of U.V. as a mutagen on *Serratia marcescens*
9. Total count of WBC/RBC
10. Radial Immuno Diffusion
11. Dot- ELISA
12. Widal test(slide test)
13. Differential count of leucocytes
14. Estimation of Hb by Sahli's method
15. Quantitative Precipitin Assay

SARDAR PATEL UNIVERSITY
BSc Biotechnology; V semester
US05DBIT026: MOLECULAR TECHNIQUES
Discipline specific
(2 CREDITS, 2 HOURS, 70 MARKS)
(Effective from June 2020)

Unit-I-- Reverse transcription and construction of c-DNA library & genomic DNA library. Recombinant selection and screening, immunochemical, nucleic acid hybridization, and colony hybridization, DNA fingerprinting-process and application.

Unit-II-- Southern, Western, Northern blotting Dot-Blot, differential screening. In situ hybridization, FISH (radioactive and non radioactive detection of hybridization) Autoradiography.

Unit-III-- Electrophoretic separation of nucleic acids (Agarose gel & Poly acrylamide gel electrophoresis). PCR introduction types (RT PCR, Multiplex PCR, Gradient PCR) and its applications.

Unit_IV-- DNA sequencing—Sanger's method, Maxam Gilbert's method cleavage automated and pyrosequencing. DNA foot printing types (Gel retardation and Dnase-1 method) and application.

Reference books

From genes to clones-Ernst winnaker

Genetic engineering-Old & Primrose; Biotechnology and genomics-P K Gupta

Genes and cloning – T A Brown ; A text book of biotechnology- R C Dubey

Learning outcome: Through this paper the understanding of various techniques using biomolecules for various purposes will be made clear to students.