

CHOITHRAM SCHOOL, MANIK BAGH, INDORE
ANNUAL CURRICULUM PLAN SESSION 2017 – 2018

CLASS: XII

SUBJECT: Biotech

Month & Working Days	Theme/ Sub-theme	Learning Objectives		Activities & Resources	Expected Learning Outcomes	Assessment
		Subject Specific (Content Based)	Behavioural (Application based)			
March 12 days April 12 days	Recombinant DNA Technology	<ul style="list-style-type: none"> Understand Basic concept of genetic engineering Learn basic tools of rDNA technology Describe restriction enzymes, cloning vectors, Construct DNA library Understand procedures, to transfer rDNA into host cell, Apply procedures to identify recombinants, Acquire knowledge of DNA sequencing, Enumerate the applications of 	<ul style="list-style-type: none"> Students will appreciate the DNA manipulation technique for welfare Students will develop scientific temperament and inquisitiveness. Students will analyze various methods of genetic engineering for improving standard of living Students will get awareness regarding developments in recombinant DNA technology 	<ul style="list-style-type: none"> Restriction digestion of DNA Transformation in bacteria Isolation of plasmid DNA Explore the site www.ncbi.nih.nlm.gov and find out any one latest research in the field of genetic engineering and discussion and sharing session will be carried in class.. 	<ul style="list-style-type: none"> List out tools used for gene exploration Describe the events involved in generating recombinant DNA molecule Properties of restriction enzymes, Choice of host cell use various safety measures while using instruments like laminar air flow bench, centrifuges, autoclave, hot air oven Utilize the knowledge on creation of a genomic library Differentiate 	1. Unit test 2. Half yearly exams 3. Assignments 4. Cast the gel and perform gel electrophoresis.

		<p>PCR.</p> <ul style="list-style-type: none">• Understand restriction fragment length polymorphism.• Understand techniques of isolating, purifying and manipulating the DNA.• Learn methods of gene sequencing and DNA fingerprinting• Understand technique site directed mutagenesis.	<p>yielded numerous new useful products in the fields of healthcare and agriculture</p> <ul style="list-style-type: none">• Value the ethical concerns regarding manipulation of DNA and learn care and safety.• Illustrating the examples like insulin, Hepatitis B vaccine etc developed by using this technique playing important role in improving health• learn to use various safety measures while using instruments like laminar air flow bench, centrifuges, autoclave, hot air oven• Students will inculcate the applications of DNA fingerprinting in		<p>genomic library and cDNA library</p> <ul style="list-style-type: none">• Restriction digestion of DNA• Transformation in bacteria• Isolation of plasmid DNA• Analysis through southern hybridization technique• Application of PCR in DNA fingerprinting,• Exploiting Sanger's method for DNA sequencing• Development of commercially important products by using technique site directed mutagenesis• Creativity, Decision Making and Logical thinking how and where to implement this so that it is only use for betterment of society and environment.	
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			<p>solving parental disputes, crime cases, archaeological research and prenatal diagnosis</p> <ul style="list-style-type: none"> • Students will develop creativity, decision Making and logical thinking • To acquaint students with different applications of biotechnology in everyday life. 			
<p>April 8 days June 16 days</p>	<p>Protein structure and function Protein engineering and proteomics</p>	<p>Understand the world of proteins,</p> <ul style="list-style-type: none"> • study the structure of 3D shape and organization of proteins, • inculcate the concept of structure-function relationship in proteins • study of, two dimensional gel electrophoresis • Learn the process 	<ul style="list-style-type: none"> • Analyze the different types of protein required for living • Students will develop scientific temperament and inquisitiveness • Finding the application of range of new products such as antibiotics, vaccines, monoclonal 	<p>Quantitative estimation of protein by biuret method to reach isoelectric point in milk and separating casein by adding HCl</p>	<ul style="list-style-type: none"> • Analysis of Mechanism of protein function • structure-function relationship in proteins • Comparison of two dimensional gel electrophoresis and one dimensional electrophoresis. • Learn the process of, purification and protein based products. 	<p>1. Unit test 2. Half yearly exams 3. Assignments</p>

		<p>of, purification and protein based products.</p> <ul style="list-style-type: none">• Understand the significance of protein function especially in case of chymotrypsin and haemoglobin.• Learn the Techniques like protein fingerprinting• Application of therapeutics and industrial enzymes, Nutraceutical protein• Learn protein design and engineering• Learn technique to improve subtilisin• Understand Creation of novel proteins• Get knowledge of nutritional value in cereals and legumes	<p>antibodies etc</p> <ul style="list-style-type: none">• Further enhance the applications of Science and Technology in the service of human welfare• Appreciate the protein fingerprinting technique for welfare.• Expose protein fingerprinting in biotechnological research and work for human welfare.• Using Subtilisin as laundry detergent to remove harsh stain• Understanding the nutrition and pharmaceutical importance of mother's milk given to new born baby.• Analyzing the role of cow's milk as the replacement of mother's milk		<ul style="list-style-type: none">• Significance of protein function specially in case of chymotrypsin and haemoglobin.• Applying protein fingerprinting to find difference between sickle cell and normal RBC.• Application of therapeutics and industrial enzymes, Nutraceutical protein• Appreciating subtilisin as an excellent detergent• Application of novel proteins for human welfare	
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			<ul style="list-style-type: none"> • Understand the importance of including curd as well as whey protein everyday in our diet • Use of novel proteins to enhance the standard of living • Spreading awareness for consumption of improved cereals and legumes increases nutritional value 			
July 24 days August 10 days	Genomics and bioinformatics	<ul style="list-style-type: none"> • Introduction and progress in stages • Define Structural genomics • Functional genomics • Differentiate between structural, functional and expression genomics • Study of Genome sequencing projects • Directed sequencing of BAC contigs 	<ul style="list-style-type: none"> • Students will be aware how their genes can be sequenced, • To make students realize that computer and technology is necessary for the advancement • the ability to interpret scientific literature and interpret data from electronic databases. 	Bioinformatics calculation based experiments 1. Classify the following sequences into DNA, RNA and protein 2. Compositional analysis of a given sequence 3. Motif analysis of a given sequence 4) Internet based experiment 1. Open the site www.ncbi.nih.nlm.gov and navigate to find out information on these databases. 2. Sequence retrieval and analysis	Current concepts concerning the molecular basis of genome structure and gene expression; Theoretical background to genome analysis strategies and technologies and an appreciation of their biotechnological applications; The significance and applications of human and other genome sequencing programs Bioinformatics techniques and applications in the	1. Unit test 2. Half yearly exams 3. Assignments

		<ul style="list-style-type: none">• Explore Random shotgun sequencing• Distinguish between Gene prediction and counting• Differentiate Genome similarity, SNP and comparative genomics• Define Functional genomics• Describe Microarray technology• Application of FISH in detection of chromosomal defects.• Introduction to proteomics• Understanding the types of proteomics• Explain Genes and proteins• Awareness about History of bioinformatics• Sequence and nomenclature• Express concept of directionality• Study different	<ul style="list-style-type: none">• the ability to use information technology to acquire relevant knowledge for their understanding of the current status of the field and its relevance to society.• the capacity to integrate knowledge across disciplines.• the ability to comprehend a question, evaluate the relevant information and communicate an answer• the capacity for independent critical thought, rational inquiry and self-directed learning and research.	of information. is of information http://www.expasy.ch	analysis of protein structure and function Application of FISH in detection of chromosomal defects Analysis of Comparative hybridization technique to detect defects Enumerate methods in protein engineering and design Application of protein engineering and design Analysis of different types of sequences Comprehend Data retrieval tools Application of data retrieval tools to retrieve the data Analysis of BLAST family as a search tools	
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		<ul style="list-style-type: none"> types of sequences • Explore data retrieval tools • Determine BLAST family of search tools • Use of bioinformatics tools in analysis. 				
<p>August 12 September 22</p>	<p>Microbial cell culture and its application:</p>	<ul style="list-style-type: none"> • introduction to microbiology • Describe microbial culture technique • Demonstration of equipments for microbial culture • Study of features of bioreactor • Enumerate the types of microbial culture • Measurement and kinetics of microbial growth • Describe growth kinetics and specific growth rate • Learn the techniques of isolation of microbial products • Understand Strain improvement of 	<ul style="list-style-type: none"> • Students will appreciate the DNA manipulation technique for welfare • Students will develop scientific temperament and inquisitiveness. • Students will analyze various methods of genetic engineering for improving standard of living • Students will get awareness regarding developments in recombinant DNA technology yielded numerous 	<p>Isolation of bacteria from curd and gram staining. Student will prepare dilution series and and perform gram staining and observe under microscope</p>	<ul style="list-style-type: none"> • To formulate growth media • Procedures for microbial culture • Safety measures while using instruments like laminar air flow bench, centrifuges, autoclave, hot air oven • Various instruments used for microbiology practical and their application • Construction of bioreactor using biochemical engineering principles • Measurement and kinetics of microbial growth 	<p>1. Unit test 2. Half yearly exams 3. Assignments . 4. Inoculate microorganism in both liquid broth and solid media and observe the colonies next day 5. Check the turbidity by colorimeter</p>

		<p>microorganisms</p> <ul style="list-style-type: none">• How to do Culture preservation• Application of microbial culture technology• Value the ethical concerns regarding microbial culture	<p>new useful products in the fields of healthcare and agriculture</p> <ul style="list-style-type: none">• Value the ethical concerns regarding manipulation of DNA and learn care and safety.• Illustrating the examples like insulin, Hepatitis B vaccine etc developed by using this technique playing important role in improving health• learn to use various safety measures while using instruments like laminar air flow bench, centrifuges, autoclave, hot air oven• Students will inculcate the applications of DNA fingerprinting in solving parental		<ul style="list-style-type: none">• To Analyze growth kinetics and calculate specific growth rate• techniques of isolation of microbial products• Importance Strain improvement of microorganisms and Culture preservation• Application of microbial culture technology• Value the ethical concerns regarding microbial culture• To analyze various methods of genetic engineering for improving standard of living• developments in recombinant DNA technology yielded numerous new useful products in the fields of healthcare and agriculture• Different applications of biotechnology in everyday life.	
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			<p>disputes, crime cases, archaeological research and prenatal diagnosis</p> <ul style="list-style-type: none"> • Students will develop creativity, decision Making and logical thinking • To acquaint students with different applications of biotechnology in everyday life. 			
October 7 days November 15 days	Plant cell culture and application:	<ul style="list-style-type: none"> • Study history of Plant cell culture • Organization of plant tissue culture laboratory • Calculate the composition of nutrient media • Describe the types of culture • Study various plant regeneration methods • Study technique of germplasm conservation 	<ul style="list-style-type: none"> • Students will develop scientific temperament and inquisitiveness. • Students will analyze various methods of genetic engineering for improving standard of living • Students will get awareness regarding developments in plant cell culture 	1.Preparation of MS media 2. sterilization of explants 2.inculation of explants in M.S media 3.Cell viability assay by evans blue	<ul style="list-style-type: none"> • Applications. Presentation of ongoing research. • Reflexion. The ability of explanation of concepts, principles and usage of the acquired knowledge in biotechnological, pharmaceutical, medical and agricultural applications. • Organization and 	1. Unit test 2. Half yearly exams 3. Assignments

		<ul style="list-style-type: none">• Explain the methods of gene transfer in plants• Learn the technique micro propagation• How to virus free plants and artificial seeds, somatic hybrids and cybrids• Production of secondary metabolite• Application of transgenic plants	<p>yielded numerous new useful products in the fields of healthcare and agriculture</p> <ul style="list-style-type: none">• Value the ethical concerns regarding manipulation of DNA and learn care and safety.• Illustrating the examples of transgenic plants with beneficial traits like stress tolerance, biotic stress tolerance, delayed fruit ripening,• learn to use various safety measures while using instruments like laminar air flow bench, centrifuges, autoclave, hot air oven• Students will understand transgenic plants as bioreactor(Molec		<p>expression of plant genome</p> <ul style="list-style-type: none">• Methods in plant biotechnology• Plant tissue cultures (types of cultures, micropropagation, automation, acclimation, breeding of healthy plants)• Production of plant secondary metabolites,• Comparison of classical and modern biotechnological methods of plant breeding• Methods of transformation of plants by bacteria and viruses• Indirect methods of transformation of	
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			<p>ular Farming)</p> <ul style="list-style-type: none">• Students will develop creativity, decision Making and logical thinking• To acquaint students with different applications of biotechnology in everyday life.		<p>plants</p> <ul style="list-style-type: none">• Possibilities of production of new proteins and other substances in genetically modified plants,• Possible influences of genetically modified plants on healthy and environment• Detection of genetically modified plants and legislation, and application	
<p>November 7 days December 15 days</p>	<p>Animal cell culture and technology</p>	<ul style="list-style-type: none">• Historical development• Study techniques of animal cell culture• Understand types of cell culture and cell lines• Characterization of cell lines• Methods for scale-	<ul style="list-style-type: none">• Students will appreciate the DNA manipulation technique for welfare• Students will develop scientific temperament and inquisitiveness.		<p>Discriminate between the different types of cell culture technologies 2. Describe the criteria for consideration for scale up of cell culture 3. Identify the appropriate cell model for a large scale process</p>	

		<p>up of cell culture</p> <ul style="list-style-type: none">• To study application of animal cell culture• To study products of animal culture• To understand and learn technique hybridoma technology• To study stem cell technology	<ul style="list-style-type: none">• Students will analyze various methods of genetic engineering for improving standard of living• Illustrating the examples of transgenic• animals with beneficial traits• Enhance their research skill as student will research various diagnostic and therapeutic application of stem ccell technology and hybridoma technology <p>Understand the significance of stem cell research</p>		<p>4. Explain recent developments in cell and tissue engineering</p> <p>5. Identify key criteria for a successful cell bank</p> <p>6. To develop understanding of industrial processes for production of antibiotics, enzymes etc.</p> <p>7. To develop understanding of techniques for tissue culture, cell culture and organ transplantation.</p> <p>8. Compare the structure and function of different specialized cells</p> <p>9. Recognize the role of master control genes in cell development</p>	
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