SUBJECT: BIOTECHNOLOGY

NAME OF THE LECTURER: Bhaskar Reddy/K.Geethanjali

Group: B.Sc LS (Biotechnology) Sem I

Paper: Cell Biology & Genetics

S.No	Month	No. of	Name of the Topic	Curricular	Co-Curricular
		Working		Activity	activity
		Days			
	October	04	1.1. Cell as basic unit of living organisms-bacterial, fungal, plant and animal	Lecture	Practice
			cells		diagrams
			1.2. Ultrastructure of prokaryotic cell (cell membrane and plasmids,		
			Nucleoid)		
		04	1.3. Ultrastructure of eukaryotic cell (cell wall, cell membrane, nucleus,		
			mitochondria, chloroplast, endoplasmic reticulum, Golgi apparatus,		Draw tables
			vacuoles)		
			1.4. Fluid mosaic model, Sandwich model, Cell membrane permeability		
	November	04	1.5. Structure of chromosome-morphology. components of chromosomes	Lecture	Assignment
			(histones and non-histones), specialized chromosomes (Polytene,		
			Lampbrush)		
		04	1.6. Chromosomal aberrations- structural and numerical		
			2.1. Bacterial cell division		
			2.2. Eukaryotic cell cycle - phases		Student
		04	2.3. Mitosis - Stages (spindle assembly) - significance		seminars
			2.4. Meiosis- Stages (synaptonemal complex) - significance		
		04	2.5. Senescence and necrosis		
			2.6. Apoptosis		

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	December	04	3.1. Mendel's experiments - factors contributing to success of Mendel's	Lecture	Quiz
			experiments		
		04	3.2. Law of segregation - Monohybrid Ratio; Law of independent		
			assortment- Dihybrid ratio, Trihybrid ratio		
			3.3. Deviation from Mendel's laws- partial or incomplete dominance (eg:		
		04	Flower Color in Mirabilis jalapa), Co-dominance (eg: MN Blood groups),		
			Non allelic interactions - types of epistasis, modification of dihybrid ratios		Student
			3.4. Penetrance and Expressivity (eg: Polvdactyly. Waardenburg		seminars
		04	syndrome). pleiotropism, phenocopy- microcephaly, cleft lip.		
	January	04	3.5. Multiple alleles (eg: Coat color in Rabbits, eye color in Drosophila and	Lecture	Assignment
			ABO Blood groups)		
			3.6. X-Y chromosomes - Sex determination in Drosophila, Man, X-linked		
		04	inheritance -Hemophilia and Color blindness; X-inactivation.		
			4.1. Linkage and recombination - Cytological proof of crossing over, phases		
			of linkage, recombination frequency, gene mapping and map distance		
		04	4.2. Non-Mendelian Inheritance - Maternal effect (Shell coiling in snail),		Group
			variegation in leaves of Mirabilis jalapa		discussion
	February	04	4.3. Cytoplasmic male sterility in Maize.	Lecture	
			4.4. Mitochondrial inheritance in human and poky in Neurospora crassa		Practice
		02	4.5. Chloroplast inheritance in Chlamydomonas		questions
			4.6. Hardy-Weinberg Equilibrium		
			Revision- Model Papers	Revision	

SUBJECT: BIOTECHNOLOGY

NAME OF THE LECTURER: Bhaskar Reddy/K.Geethanjali

Group: B.Sc LS (Biotechnology) Sem III

Paper: Molecular Biology & Genetic engineering

S.No	Month	No. of Working	Name of the Topic	Curricular Activity	Co-Curricular activity
		Days			
	October	04	1.1. DNA as the genetic material - Griffiths transformation experiment, Avery, MacLeod and McCarty's experiments and Hershey & Chase phage-labelling experiment: RNA as genetic material-Tobacco mosaic	Lecture	Differentiate Between experiments
			virus		experiments
			1.2. Organization of prokaryotic genome and eukaryotic nuclear genome		
			1.3. Organization of Mitochondrial and chloroplast genomes		
		04	origin of replication fork		Draw diagrams
	November	04	1.5. Replication of prokaryotic genome and nuclear genome of eukaryotes	Lecture	Assignment
		04	1.6. Mutations - types of mutations; spontaneous mutations and induced mutations		
		04	2.1. Structure of prokaryotic gene; structure of eukaryotic gene; structure and functions of prokaryotic RNA polymerase-subunits		Student seminars
			2.2. Transcriptional machinery in eukaryotes (RNA polymerases) and		
		04	their structural and functional features		

		 2.3. Genetic code - properties, deciphering of genetic code, wobble hypothesis 2.4. Transcription mechanism in prokaryotes - initiation, elongation & proof reading, termination (rho independent& rho dependent) 		
December	04	2.5. Transcription in eukaryotes - Initiation, elongation & termination factors	Lecture	Quiz
	04	2.6. Translation mechanism - initiation, elongation and termination3.1. Prokaryotic transcriptional regulation (inducible system) - operon concept; lac operon & glucose effect		
	04	 3.2. Prokaryotic transcriptional regulation (repressible system) - tryptophan operon 3.3. Post-transcriptional modifications - capping, poly- adenylation 3.4. Splicing and alternate splicing 		Student seminars
January	04	3.5. Post-translational modifications - glycosylation, acetylation, and ubiquitination3.6. Gal regulation in yeast - mating type gene switching	Lecture	Assignment
	04	 4.1. Enzymes used in molecular cloning: restriction endonuclease, DNA ligases, polynucleotide kinase, klenow enzyme and DNA polymerase 4.2. Cloning Vectors: PBR 322, bacteriophage, cosmid, phagemid, shuttle 		
	04	vectors 4.3. Vectors for library preparation (lambda phage vectors, cosmids, BAC & YAC)		Group discussion
February	04 02	 4.4. Gene transfer techniques: physical, chemical and biological methods 4.5. Selection of recombinant clones - colony hybridization & library screening 4.6. Applications of recombinant DNA technologies - 	Lecture	Practice questions
		agriculture, diagnostics, industrial, pharmaceutics and medicine Revision- Model Papers	Revision	

SUBJECT: BIOTECHNOLOGY

NAME OF THE LECTURER: Bhaskar Reddy/K.Geethanjali

Group: B.Sc LS (Biotechnology) Sem V

Paper: Plant Biotechnology

S.No	Month	No. of	Name of the Topic	Curricular	Co-Curricular
		Working		Activity	activity
		Days			
	October	04	1.1. Introduction to Plant tissue culture, totipotency of plant	Lecture	Differentiate
			cells (dedifferentiation, re differentiation and		Between
			regeneration)		experiments
			1.2. Nutritional requirements for plant tissue culture: nutrient		
			(carbon source, vitaming, amino acids): types of media		
			(carbon source, vitamins, annio acids), types of media		
			1.3. Plant growth regulators - auxins, cytokinins and gibberilins		Draw diagrams
		04	1.4. Preparation of media, sterilization, selection & surface		
			sulture of plant tissue <i>in vitro</i>		
	November	04	1.5 Induction of callus cultures and cell suspension cultures	Lecture	Assignment
	November	04	1.6. Organogenesis and somatic embryogenesis	Lecture	Assignment
			1.0. Organogenesis and somatic emoryogenesis		
		04	2.1 Mariatom gultura migranegation and their applications		
		•	2.1. Mension culture, incropropagation and their applications		
			2.2. Encapsulation and production of synthetics seeds and their applications		Student
		04	2.5. Cen suspension cultures (batch and continuous cultures) and applications		sominars
		04			Seminars
				1	

	04	 2.4. Protoplast isolation, culture and fusion - development of somatic hybrids cybrids and their applications 2.5. Somaclonal variation and its applications 2.6. Anther and pollen culture for production of haploids & their applications 2.7. Cryopreservation - conservation of plant germplasm 		
December	04 04	 3.1. Direct gene transfer techniques - physical methods: microinjection, partic bombardment (gene gun) and electroporation & chemical methods 3.2. Molecular mechanism of <i>Agrobucterium</i> infection and features of Ti Plasmid 	Lecture	Quiz
	04 04	 3.3. Agrobacter rum mediated gene transfer using binary and co-integrate vec 3.4. Viral vectors for gene transfer into plants 		Student seminars
January	04	 3.5. Selection of transgenic plants using reporter and selection marker genes 3.6. Genome editing - CRISPR CAS 9 Technology 4.1. Herbicide resistance in transgenic plants - glyphosate tolerance 4.2. Insect resistant transgenic plants: Bt cotton, 	Lecture	Assignment
	04	proteinase inhibitors, lectins 4.3. Virus, bacterial and fungal resistant transgenic plants		Group
		4.4. Abiotic Stress tolerance: drought, heat and salinity stress tolerant plants		discussion
February	04	4.5. Transgenic plants with enhanced nutritional value: vitamin A, oil, amino acids	Lecture	Practice
	02	4.6. Transgenic plants as bioreactors: edible vaccines, antibody production, biodegradable		questions
		Revision- Model Papers	Revision	

SUBJECT: BIOTECHNOLOGY

NAME OF THE LECTURER: K.Geethanjali

Group: B.Sc LS (Biotechnology) Sem II

Paper: Biochemistry & Microbiology

S.No	Month	No. of Working	Name of the Topic	Curricular Activity	Co-Curricular activity
		Days			
	APRIL	06	 1.1. Carbohydrates - importance, classification; structure and functions of monosaccharides (glucose & fructose), disaccharides (sucrose, lactose & maltose) and polysachharides (starch, glycogen & insulin) 1.2. Amino acids - importance, classification, structure, physical and chemical properties of amino acids; peptide bond formation 1.2. Proteine - importance, structure of proteine - primery secondary tertiany 	Lecture	Prepare the chart of classification
		06	 1.3. Proteins - Importance, structure of proteins- primary, secondary, tertiary and quaternary 1.4. Lipids - importance, classification- simple lipids (triacylglycerides & waxes), complex lipids (phospholipids & glycolipids), derived lipids (steroids, terpenes & carotenoids) 	ary, tertiary les & waxes), ls, terpenes &	Draw diagrams
		08	 1.5. Nucleic acids: structure and chemistry of DNA (Watson and crick) and RNA(TMV) structure and forms of DNA (A, B and Z) 1.6. Enzymes - importance, classification and nomenclature; Michaelis-Menton Equation, factors influencing the enzyme reactions; enzyme inhibition (competitive, uncompetitive & mixed), co-enzymes 		Student seminars
	May	06	2.1. Glycolysis, Tricarboxylic Acid (TCA) Cycle	Lecture	Assignment

			-	
	06 06 06	 2.2. Electron Transport, Oxidative Phosphorylation 2.3. Gluconeogenesis and its significance 2.4. Transamination and Oxidative deamination reactions of amino acids 2.5. f3-Oxidation of Fatty acids 2.6. Glyoxalate cycle. 3.1. Historical development of microbiology and contributors of microbiology 3.2. Microscopy: Bright field microscopy, Dark field microscopy, Phase contrast microscopy, Fluorescent microscopy, Scanning and Transmission electron microscopy 3.3. Outlines of classification of microorganisms 3.4. Structure and general characteristics of bacteria and virus 3.5. Disease causing pathogens and symptoms (eg: Mycobacterium, Hepatitis) 3.6. Structure and general characteristics of micro-algae and fungi 		Student seminars
June	06 02	 4.1. Methods of sterilization - physical and chemical methods 4.2. Bacterial nutrition - nutritional types of bacteria, essential macro, micro nutrients and growth factors. 4.3. Bacterial growth curve - batch and continuous cultures, synchronous cultures measurement of bacterial growth-measurement of cell number and cell mass 4.4. Factors affecting bacterial growth 4.5. Culturing of anaerobic bacteria and viruses 4.6. Pure culture and its characteristics Revision- Model Papers 	Lecture	Quiz Student seminars

SUBJECT: BIOTECHNOLOGY

NAME OF THE LECTURER: K.Geethanjali

Group: B.Sc LS (Biotechnology) Sem IV

Paper: Biostatistics and Bioinformatics

S.No	Month	No. of	Name of the Topic	Curricular	Co-Curricular
		Davs		ACTIVITY	activity
	APRIL	06	 1.1. Bioinformatics definition, history, scope and applications 1.2. Bioinformatics tools and resources- internet basics, role of internet, free online tools, downloadable free tools 1.3. Bioinformatic web portals — NCBI, EBI, ExPASy 	Lecture	NCBI Portal search
		06	 1.4. Biological databases: Classification of databases - primary (Genbank), secondary (PIR) and tertiary or composite (KEGG) databases 1.5. Sequence databases - DNA sequence databases (ENA & DDBJ) 1.6. Protein sequence databases (Swissprot & PROSITE) 2.1. Basics of sequence alignment - match, mismatch, gaps, gap penalties, scoring alignment 2.2. Types of sequence alignment - pairwise and multiple alignment local 		Draw diagrams
		06	and global alignment 2.3. Dot matrix comparison of sequences		Student seminars
	May	06	 2.4. Scoring matrices - PAM and BLOSUM 2.5. Pairwise sequence similarity search by BLAST and FASTA 2.6. Concepts of phylogeny - distance based (NJ method) and character based (ML method) tree construction methods 2.1. Introduction to biostatistics, kinds of data and variables, have data and the set of th	Lecture	Assignment
		06	(numerical- discrete and continuous; categorical- ordinal and nominal) -		

	06 06	 based on source (primary and secondary data); sample size, sampling methods and sampling errors. 3.2. Data tabulation and representation methods: graphical methods- stem and leaf plot, line diagram, bar graphs, histogram, frequency polygon, frequency curves; diagrammatic method- pie diagram 3.3. Measures of central tendency — mean, median, mode; merits and demerits 3.4. Measures of dispersion- range, variance, standard deviation, standard error and coefficient of variation; merits and demerits 3.5. Concepts of probability - random experiment, events, probability of an event, probability rules (addition and multiplication), uses of permutations and combinations, random variables (discrete and continuous) 3.6. Probability distributions: Binomial & Poisson distributions for discrete variables, Normal distribution for continuous variables 		Student seminars
June	06 02	 4.1. Hypothesis testing - steps in testing for statistical hypothesis, null and alternative hypothesis, level of significance- type-1 and type-2 errors 4.2. Test of significance for small samples - Student's t-test (one sample and two samples) 4.3. Test of significance for large samples - Z-test for means and proportions 4.4. Chi-square test and its applications - goodness of tit, test of independence 4.5. Analysis of Variance (ANOVA) - one way analysis 4.6. Correlation definition, simple and linear analysis, Karl Pearson's correlation coefficient 	Lecture	Practice problems Quiz Student seminars

SUBJECT: BIOTECHNOLOGY

NAME OF THE LECTURER: K.Geethanjali

Group: B.Sc LS (Biotechnology) Sem VI

Paper: Environmental Biotechnology

S.N	Mont	No. of	Name of the Topic	Curricul	Co-
0	h	Workin		ar	Curricular
		g Days		Activity	activity
	APRIL	06	1.1. Introduction to environment and pollution	Lecture	Tabulate
			1.2. Types of pollution - air, water and soil pollutions		sources of
			1.3. Types of pollutants - inorganic, organic and biotic		pollution
		06	1.4. Sources of pollution - domestic waste, agricultural waste, industrial effluents and municipal waste1.5. Greenhouse gases, global warming and climate change		Draw diagrams
		06	1.6. Measurement methods of environmental pollution - BOD & COD		
			 2.1. Renewable and non-renewable energy resources 2.2. Fossil fuels as energy source and their impact on environment 2.3. Biomass as source of energy (bioenergy) 2.4. Types of biomass - plant, animal and microbial biomass 		Student seminars
	May	06	2.5. Production of biofuels: bioethanol and biodiesel	Lecture	Assignme
			2.6. Production of biohydrogen and biomethane		nt
			3.1. Chemical fertilizers and their impact on environment		
		06	(eutrophication)		
			3.2. Concepts of biofertilizers		

	06 06	 3.3. Types of biofertilizers - bacterial, fungal and algal biofertilizers 3.4. Pesticides and their impact on environment 3.5. Concepts of biopesticides; types of biopesticides 3.6. Uses of biofertilizers & biopesticides 		Student seminars
June	06 02	 4.1. Waste water treatment - sewage and industrial effluents (aerobic and anaerobic methods) 4.2. Bioremediation - concepts and types <i>(in-situ</i> and <i>ex-situ</i> bioremediation) 4.3. Bioremediation of toxic metal ions - biosorption and bioaccumulation 4.4. Composting of organic wastes 4.5. Microbial remediation of pesticides and xenobiotic compounds 4.6. Phytoremediation- concepts and applications. 	Lecture	Practice problems Quiz
		Revision- Model Papers	Revision	Student seminars