

Maharaja Ranjit Singh College of Professional Sciences, Indore		
Department of Biosciences		
Lesson Plan - B. Sc. I Year Biotechnology (July 2020 - June 2021)		
BT+Chem+CS, BT+Chem+LS		
Paper: I		
Subject - Microbiology		
Teacher - Fatema Matkawala		
Day/Lecture	Unit	Topic
1	Unit 1	Introduction to microbiology
2		Contributions made by eminent scientists
3		Contributions made by eminent scientists
4		Contributions made by eminent scientists
5		Contributions made by eminent scientists
6		Scope and development of microbiology
7		Applications of microbiology in human welfare
8		Classification of microorganisms- General features, systems
9		Classification of microorganisms- systems
10		Microbial taxonomy, Bergey's Manual
11	Unit 2	Morphology and types of bacteria
12		Ultra structure of Eubacteria and Archaeobacteria
13		Cell wall of bacteria
14		Cell Membrane- structure and function
15		Capsule- Composition and function
16		Structure and Function of Flagella
17		Structure and Function of Pilli
18		Spheroplast, Protoplast, Prosthecae, Stalk, Gas vacuoles
19		Sheath, Glycocalyx, Internal membrane system, Mesosomes
20		Chromosomes, Nucleoid, Ribosomes, Cytoplasmic inclusions
21		Spores- endospores, exospores, Cysts,
22		Structure and diversity of virus
23		Structure and diversity of virus
24		Extremophiles
25	Unit 3	Introduction to fungi and classification
26		General characteristics, reproduction and importance of fungi
27		Structure and diversity of algae
28		Structure and diversity of protozoa
29		Mycoplasma
30		Extremophiles
31		Staining methods- Gram's, Endospore
32		Staining methods- Capsule, Flagella, Negative
33		Staining methods- Fungal, Algal

34	Unit 4	Microbial growth
35		Growth curve
36		Mathematical expression of growth
37		Factors affecting growth
38		Factors affecting growth
39		Batch, Continuous, Synchronous , Diauxic growth
40		Measurements of microbial growth
41		Measurements of microbial growth
42		Measurements of microbial growth
43		Control of microorganisms- Basics, Physical agents of control
44		Physical agents of control
45		Chemical agents of control
46		Chemical agents of control
47		Evaluation of antimicrobials -Tube dilution, Agar diffusion
48		Phenol coefficient method
49		Unit 5
50	Microbial metabolism	
51	Catabolism and Anabolism	
52	Catabolism and Anabolism	
53	Nitrogen fixation- types and mechanism	
54	Microbial diseases in plants	
55	Microbial diseases in animals	
56	Fermentation process	
57	Fermenter and its industrial importance	
58	Fermenter and its industrial importance	

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Paper: II

Subject - Cell Structure & Biology

Teacher - Zahabiya Saifee

Day/Lecture	Unit	Topic
1	I	Cell theory
2		Structure of prokaryote
3		Eubacteria & archaebacteria
4		Size, shape & arrangement of bacterial cells
5		Gram positive cells
6		Gram negative cells
7		Structure of plant cell & animal cell
8		Difference between prokaryote & eukaryote
9	II	Structure of bacterial cell- flagella, pili
10		Cell wall
11		Cytoplasmic membrane, mesosomes
12		Nuclear region
13		Ribosomes
14		Vacuoles, metachromatic granules
15		Spores & cysts
16		Structure of eukaryotic cell- cell wall
17		Cytoplasmic membrane
18		Mitochondria
19		Endoplasmic reticulum
20		Golgi bodies
21		Nucleus
22		Cytoskeleton, centrioles
23		Lysosome, microbodies
24	III	Cell cycle
25		Cell division- mitosis
26		Meiosis
27		Anomalies in cell division & associated diseases
28		Cell synchrony
29		Cell cell interaction
30		Cell locomotion
31		Cell differentiation
32	IV	Cell membrane- models of transport
33		Membrane proteins
34		Membrane carbohydrates
35		Active transport
36		Passive transport
37	V	Mechanism of necrosis
38		Mechanism of apoptosis
39		Intrinsic & extrinsic pathways
40		Apoptosis in relation to cancer
41		oncogenes & types of cancer

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Practicals	
Teacher - Fatema Matkawala	
Day/Lecture	Topic
1	To study plant cell structure using various plant materials
2	To study plant cell structure using various plant materials
3	To study microbial cell by Monochrome staining and Gram staining
4	To study microbial cell by Monochrome staining and Gram staining
5	To prepare slide and study different stages of mitosis and meiosis
6	To prepare slide and study different stages of mitosis and meiosis
7	Prepare slide for study of stomata
8	Study of permanent slides like Cell division
9	Study of permanent slides like Prokaryotic and eukaryotic cells
10	Study of permanent slides like Muscle cells and Nerve cells
11	Study of permanent slides like Transverse section of Stomatal cells
12	To study the animal cell structure using Cheek cells
13	Histochemical localization of Lignin
14	Aseptic techniques, cleaning of glasswares, preparation of cotton plugging and sterilization
15	Aseptic techniques, cleaning of glasswares, preparation of cotton plugging and sterilization
16	Isolation of Microbes from air, water and soil
17	Isolation of Microbes from air, water and soil
18	Isolation of Microbes from air, water and soil
19	Dilution and plating by Pour plate and Spread plate methods
20	Dilution and plating by Pour plate and Spread plate methods
21	Staining methods- Gram staining
22	Staining methods- Endospore staining
23	Staining methods- Fungal staining
24	Staining methods- Algal staining
25	Identification of bacteria based on staining, shape and size
26	Identification of bacteria based on staining, shape and size
27	Antibiotic sensitivity of microbes by the use of Antibiotic discs
28	Antibiotic sensitivity of microbes by the use of Antibiotic discs
29	Isolation and identification of aquatic Fungi from local water body
30	Isolation and identification of aquatic Fungi from local water body

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Lesson Plan for B. Sc. II Year Biotechnology (July 2020 - June 2021)		
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Paper: I		
Subject: Biophysics and Biochemistry		
Teacher - Mr. Shashwat Nigam		
Day/Lecture	Unit	Topic
1	I	Thermodynamic system
2		Equilibrium
3		Laws of thermodynamics
4		Laws of thermodynamics
5		Applications of laws of thermodynamics
6		Different types of processes
7		Thermodynamic variables and entropy
8		Thermodynamic potentials and relations
9		Maxwell's equations
10		Fundamental equations of heat flow
11	II	General Biophysical methods: Measurement of pH
12		Radioactive labelling and counting
13		Autoradiography
14		Diffusion and Osmosis-Definition, factors influencing them and their applications in biology
15		Viscosity-Definition, factors influencing them and their applications in biology
16		Sedimentation-Definition, factors influencing them and their applications in biology
17		Bragg's equation and unit cell
18		Reciprocal lattice and Miller indices
19		Concept of different crystal structures
20		Determination of crystal structure
21		Determination of crystal structure
22	III	Fundamentals of Biochemistry: Biochemistry as molecular logic of living beings
23		Axioms of living matter
24		Major organic compounds of animate objects: A general overview, chemical elements
25		Structure of atoms and molecules
26		Chemical bonds: Ionic bonds, Covalent bonds
27		Coordinate bonds, Hydrogen bonds
28		Structure, function and properties of water
29		Structure, function and properties of water, water as universal solvent
30		Acids, bases and salts
31		pH
32		Buffers
33	IV	Biomolecules: Carbohydrates-Introduction and occurrence, classification
34		Properties and importance of carbohydrates
35		Lipids-Introduction and occurrence
36		Classification of lipids
37		Classification of lipids
38		Properties and importance of lipids
39		Amino acids-Introduction, classification and properties of amino acids
40		Proteins-Introduction and classification
41		Classification and occurrence of proteins
42		Properties and functions of proteins

43		Nucleic acids-Introduction and properties
44		Types of nucleic acids and their structure
45		Types of nucleic acids and their structure
46		Different types of RNAs
47	V	Enzymes: Structure, classification and functions
48		Enzymes: Structure, classification and functions
49		Active-site, Activation energy
50		Transition state hypothesis
51		Lock and Key hypothesis, Induced-fit hypothesis
52		Concept of Km-Michaelis-Menten equation
53		Various types of enzyme inhibition
54		Identification of enzyme inhibition using double reciprocal plots
55		Identification of enzyme inhibition using double reciprocal plots
56		Introduction to Allosteric enzymes
57		Definitions of Holoenzymes, apoenzymes, coenzymes, cofactors, prosthetic groups with examples
58		Definitions of Holoenzymes, apoenzymes, coenzymes, cofactors, prosthetic groups with examples
59		Concept of Ribozymes, multiple forms
60		Concept of Isozymes and Abzymes

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Lesson Plan for B. Sc. II Year Biotechnology (July 2020 - June 2021)	
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Practicals	
Teacher: Dr. Mukesh K Patidar	
Day/Lecture	Topic
1	Principles and working knowledge of instruments like Colorimeter, pH meter, Centrifuge, Spectrophotometer, Microscope etc.
2	Principles and working knowledge of instruments like Colorimeter, pH meter, Centrifuge, Spectrophotometer, Microscope etc.
3	Qualitative analysis of Carbohydrates
4	Qualitative analysis of Carbohydrates
5	Qualitative analysis of Proteins
6	Qualitative analysis of Proteins
7	Qualitative analysis of Lipids
8	Quantitative estimation of Proteins by Folin-Lowry method
9	Quantitative estimation of sugar by Nelson-Somogyi method
10	Determination of enzyme activity of Amylase
11	Determination of enzyme activity of Amylase
12	Study the effect of pH on enzyme activity
13	Study the effect of pH on enzyme activity
14	Study the effect of temperature on enzyme activity
15	Study the effect of temperature on enzyme activity
16	Separation of amino acids using TLC
17	Separation of amino acids using TLC
18	Separation of leaf pigments by Paper chromatography
19	Separation of leaf pigments by Paper chromatography
20	Estimation of Hemoglobin
21	RBC counting by Haemocytometer
22	WBC counting by Differential or Total cell count
23	Computer Input and Output devices
24	Prepare a marksheet of your class subjects using Excel sheet
25	Design your class Time-table
26	Prepare a Bar diagram, Pie chart for analysis of Election results
27	Exercise based on power point presentation
28	Design a presentation illustrating insertion of pictures, word arts and clip arts
29	Use MS Word to insert a table into document
30	Problem based on Mean, Median and Mode
31	Problem based on Probability
32	Exercise based on Standard deviation
33	Biological data resources and data retrieval
34	Introduction to NCBI
35	Retrieving DNA sequence from GeneBank and analysing various formats of the data stored

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Lesson Plan for B. Sc. III Year Biotechnology (July 2020 - June 2021)		
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Paper I - Molecular Biology and Genetic Engineering		
Teacher - Dr. Fatema Matkawala		
Day/Lecture	Unit	Topic
1	I	DNA and RNA-Chemical structure
2		Types and properties of DNA and RNA
3		Experimental proof of DNA as genetic material
4		Experimental proof of DNA as genetic material
5		Genome-concept
6		Prokaryotic genome-Bacterial and viral genomes
7		Eukaryotic genome-Plant and Animal genome
8		Eukaryotic genome-Plant and Animal genome
9		DNA replication-Types, Experimental proof of semi-conservative DNA replication
10		Concept of replicons, Proteins and enzymes involved in prokaryotic and eukaryotic DNA replication
11		Modes of DNA replication, Unidirectional and Bidirectional DNA replication
12		Types of DNA replication-Y-shaped, Theta mode
13		Rolling circle replication
14		II
15	Heterochromatin and euchromatin	
16	Chromatin structure-Nucleosomes	
17	Histone and non-histone proteins	
18	Histone and non-histone proteins	
19	Histone modifications	
20	Introduction to epigenetics	
21	III	Origin of life: Classical experiments
22		Origin of life: Current concepts
23		Evolution of biological macromolecules
24		Evolution of early forms
25		Mendelian genetics: Mendel's laws
26		Chromosomal basis of heredity
27		Chromosomal analysis
28		Allelic variation, dominance
29		Linkage and crossing over
30		Linkage and crossing over
31	IV	Introduction to recombinant DNA technology
32		Scope and importance of recombinant DNA technology
33		Gene cloning
34		PCR
35		Introduction to Restriction endonucleases
36		Vectors for DNA transfer
37		Types of vectors: Plasmids
38		Phagemids
39		Cosmids

40		BAC
41	V	Plasmids: Types, properties and cloning vectors
42		Plasmids: Types, properties and cloning vectors
43		Recombinant DNA techniques
44		Recombinant DNA techniques
45		Cloning with Restriction endonucleases
46		Mutations: Types of mutations
47		Point mutations: Base-pair change, frame-shift mutation, Deletion mutation
48		Transcription in eukaryotes
49		Transcription in eukaryotes
50		Translation in eukaryotes
51		Translation in eukaryotes
52		Gene expression in eukaryotes
53		Alternative splicing
54		Alternative splicing

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Paper II - Applied Biotechnology		
Teacher - Dr. Monica Jain, Fatema Matkawala, Zahabiya Saifee		
Day/Lecture	Unit	Topic
1	Unit 1	Introduction to food microbiology
2		Microbial spoilage of food
3		Spoilage of food products
4		Spoilage of vegetables, milk, meat
5		Food preservation
6		Food preservation, asepsis, pasteurization
7		Canning, dessication, low temperature, filtration
8		Chemical methods of food preservation
9		Industrial production of enzymes, amino acids
10		Industrial production of antibiotics, vitamins
11	Unit 2	Introduction to plant tissue culture
12		Nutritional requirements
13		Nutritional requirements
14		In-vitro culture
15		Single cell culture
16		Anther culture, ovule culture
17		Somatic embryogenesis
18		Organogenesis
19		Protoplast culture
20		Somatic hybridization
21	Genetic manipulation of plants using <i>Agrobacterium</i>	
22	Unit 3	Immunity - Innate and acquired
23		Host defense mechanism
24		Organs and cells of immune system
25		Vaccines, Antigens, Adjuvants, Antibodies- Structure, Types, Production, Functions
26		Primary and secondary response, agglutination, precipitation
27		Animal Tissue Culture- Introduction
28		Equipments and materials in ATC
29		Growth curve and physical requirement of animal cell
30		Common cell lines- organisation, characteristics, cell differentiation, organ culture
31		Applications of ATC, transfection, cell fusion
32		Selectable marker, HAT selection
33		Stem cell culture, transplantation, transgenic animals
34		Bioreactor for animal cell culture
35		Unit 4
36	Primary and secondary screening	
37	Strain Improvement, Inoculum development	
38	Basic fermentation process and design	
39	Types of Fermenter, Factors affecting fermentation process	
40	Industrial sterilization, Scale up	
41	Harvest and recovery	
42	Harvest and recovery	
43	Batch, fed-batch and continuous fermentation	
44	Submerged and solid state fermentation	
45	Basic concepts of environment	

46		Significance and public awareness
47		Environment pollution
48		Assesment of water quality
49		Waste water treatment
50		Solid waste management - methods and types
51	Unit 5	Biopesticides- bacterial and fungal
52		Genetically modified crops
53		Biofertilizers - types
54		Microbial leaching, MEOR
55		Bioremediation and biodeterioation
56		Modern fuels- biogas
57		Microbial hydrogen production

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Practicals

Teacher - Zahabiya Saifee

Day	Topic
1	Chromosomal DNA isolation from Animal cells
2	Chromosomal DNA isolation from Animal cells
3	Genomic DNA isolation from Microorganisms
4	Genomic DNA isolation from Microorganisms
5	Analysis of isolated DNA by Agarose gel electrophoresis
6	Analysis of isolated DNA by Agarose gel electrophoresis
7	Spectrophotometric analysis of DNA and DNA melting
8	UV as a physical mutagen
9	UV as a physical mutagen
10	Gradient Plate technique
11	Gradient Plate technique
12	Estimation of DNA using Diphenylamine method
13	Estimation of DNA using Diphenylamine method
14	Estimation of RNA using Orcinol method
15	Estimation of RNA using Orcinol method
16	Effect of UV radiation on microbial cell
17	Effect of UV radiation on microbial cell
18	Growth of plant tissue into undifferentiated mass of callus
19	Growth of plant tissue into undifferentiated mass of callus
20	Demonstration of Radial Immunodiffusion analysis
21	Demonstration of Radial Immunodiffusion analysis
22	Isolation of microorganisms from polluted site/industrial wastes
23	Isolation of microorganisms from polluted site/industrial wastes
24	Isolation of microorganisms from polluted site/industrial wastes
25	Blood group analysis
26	Differential WBC count
27	To examine Flocculation reaction using VDRL test
28	To observe the Agglutination reaction using WIDAL test
29	Determine the concentration of unknown antigen using Radial Immuo Diffusion technique
30	Determine the concentration of unknown antigen using Radial Immuo Diffusion technique