

Maharaja Ranjit Singh College of Professional Sciences, Indore

Department of Biosciences

Lesson Plan - B. Sc. I Year Biotechnology (July 2018 - June 2019)

BT+Chem+CS, BT+Chem+LS

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 Pili
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	Microbial nutrition and nutritional requirement of microbes
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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Subject - Cell Structure & Biology

Teacher - Zahabiya Saifee

Day/Lecture	Unit	Topic
1	I	Cell theory
2		Structure of prokaryote
3		Eubacteria & archaeobacteria
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		Cell wall of bacteria
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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Lesson Plan for B. Sc. I Year Biotechnology (July 2018 - June 2019)

BT+Chem+CS, BT+Chem+LS

Subject: 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	Cell wall of bacteria
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. I Year Biotechnology (July 2018 - June 2019)

BT+Chem+CS, BT+Chem+LS

Subject: Biophysics and Biochemistry

Teacher - 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		Cell wall of bacteria
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 - B. Sc. II Year Biotechnology (July 2018 -June 2019)

Subject - Bioinstrumentation, Biostatistics and Bioinformatics

Teacher - Dr. Mukesh Patidar

Day/Lecture	Unit	Topic
1	1	Microscopy - Introduction
2		Light Microscope
3		Phase contrast microscope
4		Fluorescence microscope
5		Electron Microscope - TEM
6		Electron Microscope - SEM
7		Centrifugation - Principle
8		Centrifugation - Types
9		Centrifugation - Types
10		Separation of biological molecules
11		Separation of biological molecules
12	2	Chromatography - Principle
13		Chromatography - Types
14		Chromatography - Applications
15		Electrophoresis - Principle
16		Electrophoresis - Applications
17		Agarose gel electrophoresis
18		Immunoelectrophoresis
19		Southern Blotting
20		Western Blotting
21		Northern Blotting
22	3	Spectrophotometry - Principle and applications
23		Visible colorimetry
24		UV Spectroscopy
25		UV Spectroscopy
26		Radio labelling
27		Radio labelling
28		Non Radio Labelling
29		Non Radio Labelling
30		Autoradiography
31		Autoradiography
32	4	Biostatistics - Introduction
33		Biostatistics - Scope
34		Biostatistics - Application
35		Use of statistical collection and classification of data
36		Data summarization and presentation
37		Arithmetic mean and median
38		Standard deviation
39		Probability - Definition

40		Random variables and its distribution
41		Binomial probability distribution
42	5	Computers - General Introduction
43		Organization of hardware
44		Softwares and Internet application
45		Basic bioinformatics - Intro to internet and search engines
46		Sequence databases
47		Sequence databases
48		Protein family/ domain database
49		Introduction to cluster database
50		Specialized Database and Database technology
51		Structural databases

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Lesson Plan for B. Sc. II Year Biotechnology (July 2018 - June 2019)

BT+Chem+CS, BT+Chem+LS

Subject: 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	Cell wall of bacteria
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 GenBank and analysing various formats of the data stored

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Lesson Plan for B. Sc. III Year Sem V Biotechnology (July 2018 - Dec 2018)

BT+Chem+CS, BT+Chem+LS

Paper-Immunology and Animal Biotechnology

Teacher - Zahabiya Saifee

Day/Lecture	Unit	Topic
1	I	Immunity-Innate and acquired, Host defence mechanism- First, second and third lines of host defence
2		Infection and its type
3		Organs and cells of Immune system
4		Organs and cells of Immune system
5		Vaccines and their types
6	II	Antigens- Properties and types
7		Adjuvants, Immunoglobulins- structure, types and functions
8		Immunoglobulins-structure, types and functions
9		Generation of antibodies
10		Primary and secondary immune response
11		Agglutination and precipitation reactions
12		Hemagglutination, Immunofluorescence
13		ELISA, RIA
14		Coomb's test (Direct and indirect)
15		Latex agglutination
16	ODD and RID	
17	III	History and development of cell culture
18		Equipments and materials for animal cell culture
19		Culture media for animal cell culture-BSS
20		Culture media for animal cell culture- Serun-containing and serum-free media
21		Growth factors- EGF, ECF, PDGF
22		Growth factors- IL-1, IL-2, NGF and Erythropoetin
23		Physical requirements of growing animal cells in culture
24	IV	Initiation of cell culture, Isolation and disaggregation of explants
25		Development of primary culture
26		Commonly used cell lines- their organizations and characteristics
27		Commonly used cell lines- their organizations and characteristics
28		Growth curve of animal cell clture
29		Differentiation of cells
30		Organ culture- techniques, advantage and applications
31		Organ culture- techniques, advantage and applications
32	V	Applications of animal biotechnology- Methods of transfection of animal cells
33		Applications of animal biotechnology- Methods of transfection of animal cells
34		Methods of cell fusion, selectable markers
35		HAT selection, Transgenic animals
36		Stem cell culture
37		Transplantation of cultured cells,
38	Bioreactors for large-scale production of animal cells	

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Lesson Plan for B. Sc. III Year Sem V Biotechnology (July 2018 - Dec 2018)	
BT+Chem+CS, BT+Chem+LS	
Subject - Practicals	
Teacher - Zahabiya Saifee	
Day/Lecture	Topic
1	Determination of blood group
2	Total count of WBC
3	Total count of RBC
4	Differential count of WBC
5	Haemoglobin estimation by Sahli's method
6	To examine flocculation reaction using VDRL test
7	To observe the agglutination reaction using WIDAL test
8	Determine the concentration of unknown antigen using Radial Immuno Diffusion technique
9	Determine the concentration of unknown antigen using Radial Immuno Diffusion technique
10	To determine the antibody antigen reaction by performing ODD technique
11	To determine the antibody antigen reaction by performing ODD technique
12	Enzyme Linked Immuno Sorbent Assay

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Lesson Plan for B. Sc. III Year Sem VI Biotechnology (Jan 2019 - June 2019)

BT+Chem+CS, BT+Chem+LS

Paper- Plant and Environmental Biotechnology

Teacher - Dr. Monica Jain, Sakina Ratlamwala

Day/Lecture	Unit	Topic
1	I	Introduction to and history of plant tissue culture
2		Introduction to and history of plant tissue culture
3		MS Media for plant tissue culture
4		Use of Growth regulators
5		Selection and maintenance of callus
6		Selection and maintenance of callus
7		Single cell culture
8		Single cell culture
9		Cytodifferentiation
10		Cytodifferentiation
11		Micropropagation
12		Micropropagation
13	II	Organogenesis
14		Somatic Embryogenesis
15		Somatic Embryogenesis
16		Synthetic Seed and its application
17		Haploid Plants- Anther and Ovary culture
18		Haploid Plants- Anther and Ovary culture
19		Haploid Plants- Anther and Ovary culture
20		Production of haploids and their uses
21		Production of haploids and their uses
22		<i>In vitro</i> pollination
23		<i>In vitro</i> fertilization
24	III	Protoplast isolation
25		Testing of viability
26		Regeneration of protoplast and protoplast fusion
27		Regeneration of protoplast and protoplast fusion
28		Markers for selection of hybrid cell
29		Practical applications of somatic hybridization
30		Introduction to Cybrids

31		Introduction to transgenic plants
32		Genetic manipulation of plants-use of <i>Agrobacterium tumifaciens</i>
33		Genetic manipulation of plants-use of <i>Agrobacterium rhizogenes</i>
34		Transfection methods
35		Advantages of Transgenic Plants
36	IV	Environment: Basic concept
37		Environment: Basic concept
38		Environment-Significance
39		Environment-Public awareness
40		Environmental pollution
41		Assessment of water and waste water quality
42		Treatment of waste-water – Primary
43		Secondary, advanced and final treatments
44		Solid waste management- composting
45		Solid waste management -vermiculture
46		Solid waste management - methane production
47	V	Biopesticides- Bacterial and Fungal
48		Genetically modified crops containing insecticidal genes
49		Biofertilizers-Nitrogen fixers
50		PSB, Mycorrhiza and VAM
51		Microbial leaching of copper and uranium
52		Microbial Enhanced Oil Recovery
53		Bioremediation and Biodeterioration
54		Modern fuels-Methanogenic bacteria and biogas
55		Microbial hydrogen production
56		Gasohol experiment
57		Solar energy

Cell wall of bacteria

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Lesson Plan for B. Sc. III Year Sem VI Biotechnology (Jan 2019 - June 2019)	
BT+Chem+CS, BT+Chem+LS	
Subject - Practicals	
Teacher - Dr. Monica Jain, Sakina Ratlamwala	
Day/Lecture	Topic
1	Introduction to plant tissue culture techniques
2	Media preparation and sterilization and methods of surface sterilization of explants
3	Seed germination in-vitro for aseptic collection of explants.
4	Micropropagation
5	Callus induction from leaf, stem and roots
6	Organogenesis
7	Somatic embryogenesis
8	Preparation of synthetic seeds
9	Suspension culture propagation and uses
10	Protoplast isolation and culture
11	Demonstrate the enzymatic conversion of ammonia to nitrates by soil microorganisms
12	Quantitative and qualitative microbiological analysis of potable water and water
13	Microbiological analysis of soil
14	Isolation of Rhizobium from root nodules
15	Isolation of Azotobacter from soil
16	Measurement of BOD and COD and dissolved oxygen
17	Measurement of total dissolved salts