

# Maharaja R

## Lesson P

Day/Lecture	Unit
1	Unit 1
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	Unit 2
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	Unit 3
26	
27	
28	
29	
30	
31	
32	
33	
34	Unit 4
35	
36	
37	
38	
39	
40	
41	
42	
43	

44	
45	
46	
47	
48	
49	Unit 5
50	
51	
52	
53	
54	
55	
56	
57	
58	

# **Ranjit Singh College of Professional Sciences, Indore**

Department of Biosciences

Plan - B. Sc. I Year Biotechnology (July 2017 - June 2018)

BT+Chem+CS, BT+Chem+LS

Subject - Microbiology

Teacher - Dr. Anand Nigohar, Fatema Matkawala

<b>Topic</b>
Introduction to microbiology
Contributions made by eminent scientists
Contributions made by eminent scientists
Contributions made by eminent scientists
Contributions made by eminent scientists
Scope and development of microbiology
Applications of microbiology in human welfare
Classification of microorganisms- General features, systems
Classification of microorganisms- systems
Microbial taxonomy, Bergey's Manual
Morphology and types of bacteria
Ultra structure of Eubacteria and Archaeobacteria
Cell wall of bacteria
Cell Membrane- structure and function
Capsule- Composition and function
Structure and Function of Flagella
Structure and Function of Pili
Spheroplast, Protoplast, Prosthecae, Stalk, Gas vacuoles
Sheath, Glycocalyx, Internal membrane system, Mesosomes
Chromosomes, Nucleoid, Ribosomes, Cytoplasmic inclusions
Spores- endospores, exospores, Cysts,
Structure and diversity of virus
Structure and diversity of virus
Extremophiles
Introduction to fungi and classification
General characteristics, reproduction and importance of fungi
Structure and diversity of algae
Structure and diversity of protozoa
Mycoplasma
Extremophiles
Staining methods- Gram's, Endospore
Staining methods- Capsule, Flagella, Negative
Staining methods- Fungal, Algal
Microbial growth
Growth curve
Mathematical expression of growth
Factors affecting growth
Factors affecting growth
Batch, Continuous, Synchronous, Diauxic growth
Measurements of microbial growth
Measurements of microbial growth
Measurements of microbial growth
Control of microorganisms- Basics, Physical agents of control

Physical agents of control
Chemical agents of control
Chemical agents of control
Evaluation of antimicrobials -Tube dilution, Agar diffusion
Phenol coefficient method
Microbial nutrition and nutritional requirement of microbes
Microbial metabolism
Catabolism and Anabolism
Catabolism and Anabolism
Nitrogen fixation- types and mechanism
Microbial diseases in plants
Microbial diseases in animals
Fermentation process
Fermenter and its industrial importance
Fermenter and its industrial importance

**Maharaja Ranjit Singh College of Professional Sciences**

Department of Biosciences

Lesson Plan - B. Sc. I Year Biotechnology (July 2017 - June 2018)

BT+Chem+CS, BT+Chem+LS

Subject - Cell Structure &amp; Biology

Teacher - Dr. Monica Jain, Baishali Roy

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		Mechanism of necrosis
38		Mechanism of apoptosis

39	V	Intrinsic & extrinsic pathways
40		Apoptosis in relation to cancer
41		oncogenes & types of cancer

**Maharaja Ranjit Singh College of Professional Sciences**

Department of Biosciences

Lesson Plan for B. Sc. I Year Biotechnology (July 2017 - June 2018)

BT+Chem+CS, BT+Chem+LS

Subject: Practicals

**Teacher - Fatema Matkawala**

<b>Day/Lecture</b>	<b>Topic</b>
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

**Maharaja Ranjit Singh College of Professional Sciences, Indore**

Department of Biosciences

Lesson Plan - B. Sc. Year II Sem III Biotechnology (July 2017 - Dec 2017)

Subject - Molecular Biology

BT+CS+Chem, BT+LS+Chem

Teacher - Sakina Ratlamwala

Day/Lecture	Unit	Topic
1	I	DNA And RNA-Chemical structure, Types and Properties
2		DNA And RNA-Chemical structure, Types and Properties
3		Experimental proof of DNA as genetic material
4		Experimental proof of DNA as genetic material
5		Genome-concept, Bacterial and viral genomes
6		Plant and Animal genome
7		Plant and Animal genome
8		DNA replication-Types
9		Experimental proof of semi-conservative replication, Replicon concept
10		Proteins and enzymes involved in replication in prokaryotes and eukaryotes
11		Proteins and enzymes involved in replication in prokaryotes and eukaryotes
12		Modes of DNA replication, Unidirectional and bidirectional replication
13		Types of DNA replication- Y-shaped, Theta mode, rolling circle replication
14		Types of DNA replication- Y-shaped, Theta mode, rolling circle replication
15	II	Eukaryotic chromosomal organization
16		Heterochromatin, Euchromatin
17		Chromatin structure-Nucleosomes
18		Chromatin structure-Nucleosomes
19		Histone and non-histone proteins
20		Histone modification
21		Histone modification
22		Introduction to Epigenetics
23	Introduction to Epigenetics	
24	III	Central Dogma of Molecular Biology, Gene concept
25		Prokaryotic genes, Eukaryotic genes
26		Transcription
27		Transcription
28		Regulation of transcription in prokaryotes
29		Regulation of transcription in eukaryotes (Post transcriptional RNA processing)
30		Regulation of transcription in eukaryotes (Post transcriptional RNA processing)
31		Concept of mRNA and hnRNA, RNA processing
32		RNA processing, Splicing in eukaryotes
33		Translation in prokaryotes and eukaryotes
34	Translation in prokaryotes and eukaryotes	
35	IV	Regulation of gene expression in prokaryotes, Operon concept
36		Induction and repression, Catabolite repression
37		Operon models-Lac operon
38		Trp operon
39		Attenuation and enhancer elements
40		Insertion elements and transposons
41		Mutations-Silent, Point, frameshift
42		Transition, transversion, non-sense mutations
43	V	DNA damage and repair, UV damage, SOS repair
44		DNA damage and repair, UV damage, SOS repair
45		Genomic and Plasmid DNA isolation from bacteria
46		Enzymes in restriction digestion and ligation
47		Linkers, Introduction to vectors for DNA transfer
48		Plasmid, Phage
49		Cosmid, Phagemid
50		BAC and YAC
51		Gene amplification-PCR
52		Concept of Gene mapping
53	Concept of Gene mapping	



**Maharaja Ranjit Singh College of Professional Sciences, Indore**

Department of Biosciences

Lesson Plan - B. Sc. Year II Sem III Biotechnology (July 2017 - Dec 2017)

Subject - Molecular Biology

BT+CS+Chem, BT+LS+Chem

Teacher - Sakina Ratlamwala

<b>Day/Lecture</b>	<b>Topic</b>
1	Chromosomal DNA isolation from Plant cells
2	Chromosomal DNA isolation from Plant cells
3	Chromosomal DNA isolation from Animal cells
4	Chromosomal DNA isolation from Animal cells
5	Genomic DNA isolation from Micro-Organisms
6	Genomic DNA isolation from Micro-Organisms
7	Analysis of isolated DNA by Agarose gel electrophoresis
8	Spectrophotometric analysis of DNA and DNA melting
9	To study the effect of UV as a physical mutagen
10	To study the effect of UV as a physical mutagen
11	To study Gradient Plate Technique
12	To study Gradient Plate Technique

# Maharaja Ranjit Singh College of Professional Sciences, Indore

Department of Biosciences

Lesson Plan - B. Sc. Year II Sem IV Biotechnology (Jan 2018 - June 2018)

Subject - Microbial Biotechnology

BT+CS+Chem, BT+LS+Chem

Teacher - Prof. Fatema Matkawala

Day/Lecture	Unit	Topic
1	I	Microbial classification - 3 Kingdom
2		Microbial classification - 5 Kingdom
3		Microbial classification - 3 domain
4		Bacterial Nutrition
5		Bacterial Nutrition
6		Nutritional classes of bacteria
7		Nutritional classes of bacteria
8		Microbial media and its types
9		Microbial media and its types
10		Methods of cultivation of microbes - aerobic
11		Methods of cultivation of microbes - aerobic
12		Methods of cultivation of microbes - anaerobic
13	II	Microbial growth
14		Mathematical expression of growth
15		Growth curve
16		Factors affecting growth
17		Batch culture
18		Continuous culture
19		Synchronous culture and diauxic growth
20		Quantification of microbial growth
21		Quantification of microbial growth
22		Physical control of microorganism
23		Chemical control of micro organism
24		Evaluation of chemical disinfectant- Tube dilution test
25		Evaluation of chemical disinfectant- diffusion test
26		Evaluation of chemical disinfectant- Phenol Coefficient
27	III	Fermentation Technology
28		Fermentation Technology
29		Primary and Secondary Screening
30		Primary and Secondary Screening
31		Strain Improvement
32		Inoculum Development
33		Industrial Sterilisation process
34		Scale-up and Harvest
35		Scale-up and Harvest
36		Recovery process
37		Recovery process
38	IV	Types of fermentation – batch
39		Types of fermentation – Continuous
40		Types of fermentation – Fed - batch
41		Submerged fermentation process
42		Solid State fermentation process
43		Basic design of a fermentor
44		Basic design of a fermentor
45		Factors affecting fermentor design
46		Types of fermentors- Fluidized, Packed Bed
47		Air lift Fermentor
48		Tray Fermentor

49		Tower Fermentor
50	V	Industrial Production of Ethyl Alcohol
51		Industrial Production of Penicillin
52		Industrial Production of Cyanocobalamin
53		Industrial Production of Glutamic Acid
54		Industrial Production of Citric Acid
55		Industrial Production of Amylase
56		Industrial Production of Protease

<b>Maharaja Ranjit Singh College of Professional Sciences, Indore</b>	
Department of Biosciences	
Lesson Plan - B. Sc. Year II Sem IV Biotechnology (Jan 2018 - June 2018)	
Subject - Microbial Biotechnology	
BT+CS+Chem, BT+LS+Chem	
Teacher - Prof. Fatema Matkawala	
<b>Day/Lecture</b>	<b>Topic</b>
1	Principles and working knowledge of instruments like Autoclave, Laminar Air Flow, Hot Air Oven, Colony Counter etc.
2	Principles and working knowledge of instruments like Autoclave, Laminar Air Flow, Hot Air Oven, Colony Counter etc.
3	Isolation of Micro-organism by Sector plate method
4	Isolation of Micro-organism by Sector plate method
5	Isolation of Micro-organism by Pour plate method
6	Isolation of Micro-organism by Pour plate method
7	Enumeration of bacteria by standard plate count method
8	Enumeration of bacteria by standard plate count method
9	Techniques for the Cultivation of Anaerobic Microorganisms
10	Techniques for the Cultivation of Anaerobic Microorganisms
11	Effect of temperature on microbial growth
12	Effect of temperature on microbial growth
13	Effect of pH on microbial growth
14	Effect of pH on microbial growth
15	Isolation of extremophiles
16	Isolation of extremophiles
17	Isolation of extremophiles
18	Primary Screening for antibiotic producing microorganisms
19	Primary Screening for antibiotic producing microorganisms
20	Primary Screening for amylase and protease producing microorganisms
21	Primary Screening for amylase and protease producing microorganisms

**Maharaja Ranjit Singh College of Professional Sciences, Indore**

Department of Biosciences

Lesson Plan for B. Sc. III Year Sem V Biotechnology (July 2017 - Dec 2017)

BT+Chem+CS, BT+Chem+LS

Paper-Immunology and Animal Biotechnology

Teacher - Baishali Roy

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	III	ODD and RID
17		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- Serum-containing and serum-free media
21		Growth factors- EGF, ECF, PDGF
22		Growth factors- IL-1, IL-2, NGF and Erythropoietin
23	IV	Physical requirements of growing animal cells in culture
24		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 culture
29		Differentiation of cells
30		Organ culture- techniques, advantage and applications
31		Organ culture- techniques, advantage and applications
32		V
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	

**Maharaja Ranjit Singh College of Professional Sciences, Indore**

Department of Biosciences

Lesson Plan for B. Sc. III Year Sem V Biotechnology (July 2017 - Dec 2017)

BT+Chem+CS, BT+Chem+LS

Subject - Practicals

Teacher - Baishali Roy

<b>Day/Lecture</b>	<b>Topic</b>
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

## Maharaja Ranjit Singh College of Professional Sciences, Indore

Department of Biosciences

Lesson Plan for B. Sc. III Year Sem VI Biotechnology (Jan 2018 - June 2018)

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		Micropropogation
12		Micropropogation
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



**Maharaja Ranjit Singh College of Professional Sciences, Indore**

Department of Biosciences

Lesson Plan for B. Sc. III Year Sem VI Biotechnology (Jan 2018 - June 2018)

BT+Chem+CS, BT+Chem+LS

Subject - Practicals

Teacher - Dr. Monica Jain, Sakina Ratlamwala

<b>Day/Lecture</b>	<b>Topic</b>
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