

Maharaja Ranjit Singh College of Professional Sciences, Indore		
Department of Biosciences		
Lesson Plan - B. Sc. Year I Microbiology (July 2019 - June 2020)		
Micro+Chem+LS, Micro+Chem+Pharma		
Paper I - General Microbiology and Cell Biology		
Teacher - Fatema Matkawala, Zahabiya Saifee		
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		Banches of microbiology
8		Concept of diseases
9		Applications of microbiology in human welfare
10	Unit 2	Classification of microorganisms
11		Classification of microorganisms
12		Morphology and types of bacteria
13		Ultra structure of Eubacteria and Archaeobacteria
14		Cell wall of bacteria
15		Cell Membrane- structure and function
16		Capsule- Composition and function
17		Structure and Function of Flagella
18		Structure and Function of Pilli
19		Spheroplast, Protoplast, Prosthecae, Stalk, Gas vacuoles
20		Sheath, Glycocalyx, Internal membrane system, Mesosomes
21		Chromosomes, Nucleoid, Ribosomes, Cytoplasmic inclusions
22		Spores- endospores, exospores, Cysts,
23		Cyanobacteria, Actinomycetes, Mycoplasma
24		Rickettsia, Chlamydia
25	Unit 3	Introduction to fungi and classification
26		General characteristics, thallus, mycelia
27		Nutrition, Heterokaryosis
28		Structure and function of parts of fungi
29		Reproduction- sexual and asexual
30		Economic importance of fungi
31		Introduction and classification of phage
32		Morphology and structure of phages
33		Phage- nucleic acid, host,
34		Reproduction- lytic and lysogenic cycles
35		Reproduction- lytic and lysogenic cycles
36		DNA and RNA virus
37		T4, TMV, Pox virus, Prions, Virions, Virusoid, Viriod
38		

39	Unit 4	Structure and organisation and function of cell organelles
40		Structure and organisation and function of cell organelles
41		Structure and organisation and function of cell organelles
42		Cell cycle
43		Cell division
44		Membrane structure and intercellular transport
45		Cellular interaction and locomotion
46		Cell differentiation
47		Cell senescence
48		Unit 5
49	Pure, axenic, mixed culture, strain, isolate, clone	
50	Pure culture techniques- spread plate, pour plate, streak plate methods	
51	Serial dilution, Enrichment culture technique	
52	Micromanipulator	
53	Maintainance and preservation of pure cultures	
54	Maintainance and preservation of pure cultures	
55	Maintainance and preservation of pure cultures	
56	Maintainance and preservation of pure cultures	
57	Major culture collection centres of India	

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Paper II- Tools and Techniques in Microbiology

Teacher -Dr. Mukesh K Patidar

Day/Lecture	Unit	Topic
1	Unit 1	Microscopy- Introduction
2		Light Microscopy
3		Phase Contrast Microscopy
4		Flourescence Microscopy
5		Electron Microscopy -SEM
6		Electron Microscopy -TEM
7		Preparation of specimen
8		Limitation and application of Microscopy
9		Use of Software in Microscopy
10	Unit 2	Basic principleand function of Autoclave
11		Oven - Principle and application
12		BOD Incubator -Principle and applications
13		LAF- Principle
14		Colorimeter
15		Spectrophotometer
16		Centrifugation
17		Principle of Sedimentation
18		Chromatography -Introduction
19		Types of chromatography
20	Applications of chromatography	
21	Unit 4	Ocular and stage micrometry
22		Cell count and haemocytometry
23		Useof camera lucida
24		Stain and staining techniques
25		Chemistry of dye and stains
26		Monochrome and Negative staining
27		Differentialstaining -Gram's Staining
28		Acid fast staining
29		Cell wall staining, metachromatic granules staining
30		Capsule staining
31	Unit 5	Typesof media and preparation of medium
32		Characteristics of growth medium
33		Control of microorganisms -Physical methods
34		Control of microorganisms -Physical methods
35		Control of microorganisms -Physical methods
36		Control of microorganisms -Chemical methods
37		Control of microorganisms -Chemical methods
38		Control of microorganisms -Chemical methods

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Practicals	
Teacher - Dr. Mukesh K Patidar	
Day/Lecture	Topic
1	Demonstration and briefing about principles and working of basic instruments, autoclave, incubator, hot-air oven, Laminar air flow
2	Demonstration and briefing about principles and working of pH meter, Spectrophotometer and Centrifuge
3	Basic media preparation, autoclaving, cleaning and sterilization of glass wares
4	Basic media preparation, autoclaving, cleaning and sterilization of glass wares
5	Media preparation: Liquid media-Peptone water, Nutrient Broth, Solid media-Nutrient agar (Agar slant, Agar plate)
6	Media preparation: Enriched medium- Blood agar, Differential medium-Mac Conkey agar
7	Media preparation: Enrichment medium-Selenite F broth, Selective medium-EMB
8	Culture characteristics of Microorganisms on different media
9	Culture characteristics of Microorganisms on different media
10	Culture characteristics of Microorganisms on different media
11	Demonstration of Selective and Differential media
12	Demonstration of Selective and Differential media
13	Isolation of bacteria from water by serial dilution agar plating method
14	Isolation of bacteria from water by serial dilution agar plating method
15	Isolation of bacteria from soil by serial dilution agar plating method
16	Isolation of bacteria from soil by serial dilution agar plating method
17	Isolation of fungi from water by serial dilution agar plating method
18	Isolation of fungi from water by serial dilution agar plating method
19	Isolation of fungi from soil by serial dilution agar plating method
20	Isolation of fungi from soil by serial dilution agar plating method
21	Estimation of air microflora
22	Estimation of air microflora
23	Isolation of bacteria by Pour-plate method
24	Isolation of bacteria by Pour-plate method
25	Isolation of bacteria by Streak-plate method
26	Isolation of bacteria by Streak-plate method
27	Isolation of bacteria by Spread-plate method
28	Isolation of bacteria by Spread-plate method
29	Preparation of smear and microscopic examination of Fungi- <i>Mucor</i> sp, <i>Aspergillus</i> sp.
30	Preparation of smear and microscopic examination of Fungi- <i>Penicillium</i> sp. and <i>Alternaria</i> sp.
31	Preparation of smear and microscopic examination of Bacteria- <i>Staphylococcus</i> sp, <i>Lactobacillus</i> sp.

32	Preparation of smear and microscopic examination of Bacteria- <i>Escherichia</i> sp., <i>Vibrio</i> sp. and <i>Leptospira</i> sp.
33	Staining techniques- Simple staining, Differential staining (Gram's, Ziehl-Neelson)
34	Staining techniques-Spore and Capsular staining methods

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Paper I- Biochemistry and Microbial Physiology		
Teacher - Shashwat Nigam		
Day/Lecture	Unit	Topic
1	1	Carbohydrate Introduction and Properties
2		Classification of Carbohydrates
3		Classification of Carbohydrates and Functions
4		Important properties of proteins and amino acids
5		Classification of proteins and amino acids
6		Enzymes - Introduction and classification
7		Nomenclature and Factors affecting enzymatic activity
8		Factors affecting enzymatic activity
9		Mechanism of enzyme action
10		Regulation of enzyme activity
11		Applications of enzymes
12	2	Growth- Introduction and measurement
13		Growth - Mathematical expression
14		Growth curve and growth yield
15		Effect of nutrient, temperature and oxygen on growth
16		Effect of pH and osmotic pressure on growth
17		Cell count by direct method and indirect method
18		Cell count by dry weight and wet weight method
19		Synchronous and Continuous culture
20		Continuous culture
21		Batch Culture
22	3	Intro- Energy Production in aerobic & anaerobic process
23		Glycolysis
24		Pentose phosphate pathway
25		Entner Doudoroff Pathway
26		Fermentation & glucose fermentation by E.coli
27		TCA cycle, Heterotrophic carbon dioxide fixation
28		Glyoxylate cycle, Catabolism of lipids- Alpha & Beta Oxd.
29		Catabolism of proteins, Aerobic respiration
30		Principle of bioenergetics, Oxd and red reaction
31		Redox potential, Oxidative phosphorylation hypothesis
32		Introduction - Utilization of energy
33		Methods of studying microbial biosynthesis
34		Assimilation of ammonia and sulfate
35		Assimilation of nitrogen

36	4	Utilization of energy in non biosynthetic process
37		Utilization of energy in biosynthetic process
38		Diffusion, gaseous exchange and osmosis
39		Plasmolysis and Active transport of nutrients in bacteria
40		Passive diffusion and facilitated diffusion
41		Group translocation
42	5	Intro- Energy Production by photosynthesis
43		Photochemical reaction
44		Cyclic photophosphorylation
45		Non-cyclic photophosphorylation
46		Role of ATP in metabolism
47		Role of reducing power in metabolism
48		Role of precursors of metabolism
49		Component of electron transport chain
50		Component of electron transport chain
51		Arrangement of ETC in cell membrane

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Paper II - Microbial Genetics & Molecular Biology		
Teacher - Zahabiya Saifee		
Day/Lecture	Unit	Topic
1	I	Structure & genetic material of microbes
2		DNA structure & types
3		Role of nuclear matrix in chromosome organization
4		DNA melting curve & T _m value
5		Buoyant density of DNA & its relation with G/C content
6		Types of rRNA, tRNA, mRNA
7		Gene structure & function
8	II	Types of DNA replication
9		Prokaryotic replication
10		Eukaryotic replication
11		Modes of replication
12		Messelson & Stahl Exp
13		DNA topology, supercoiling & linking number
14		DNA replication- enzymes & mechanism
15		Transcription in prokaryotes & eukaryotes
16	III	Features of genetic code
17		Polycistronic RNA
18		Deciphering of genetic code
19		Gene translocation
20		Translation in prokaryotes- initiation, elongation & termination
21		Translation in eukaryotes
22		Post translational modifications
23		Regulation of protein synthesis- Lac operon
24		Repressible operon
25	IV	Genetic recombination in bacteria
26		Transformation
27		Conjugation
28		Transduction
29		Plasmids & binary vectors
30		Transposons
31		Use of bacteria & viruses in genetic engineering
32	V	DNA mutations
33		Spontaneous mutation
34		Fluctuation test, new comb's test & replica test
35		Mutagens- chemical & physical

36	Reversion & suppression
37	DNA repair pathways- photoreactivation, excision repair
38	Mis match repair, SOS repair

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Practicals

Teacher - Shashwat Nigam

Day/Lecture	Topic
1	To determine the pH of the given solution
2	Prepare buffer solution
3	Identification of biomolecules- carbohydrates, protein, lipids
4	Identification of biomolecules- carbohydrates, protein, lipids
5	Identification of biomolecules- carbohydrates, protein, lipids
6	Estimation of glucose by Cole's method
7	Estimation of glucose by Cole's method
8	Estimation of protein by Folin Lowry method
9	Estimation of lipid by dichromate method
10	Study of enzyme activity
11	Effect of factors on enzyme activity
12	Effect of factors on enzyme activity
13	Demonstration of isolation of DNA
14	Quantitative estimation of DNA by DPA method
15	Quantitative estimation of RNA by Orcinol method
16	Effect of UV light on bacterial growth
17	Effect of UV light on bacterial growth
18	Replica plating method
19	Replica plating method
20	Screening of amylase producers
21	Screening of amylase producers
22	Screening of protease producers
23	Screening of protease producers

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Lesson Plan - B. Sc. Year III Microbiology (July 2019 - June 2020)		
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Paper I - Applied and Environmental Microbiology		
Teacher - Fatema Matkawala, Shashwat Nigam		
Day/Lecture	Unit	Topic
1	Unit 1	Introduction to Fermentation
2		Basic fermentation process and design
3		Types of Fermenter
4		Factors affecting fermentation process
5		Strain Improvement
6		Methods of Immobilization
7		Immobilization and its applications
8		Industrial production of alcohol, organic acid
9		Industrial production of enzymes, amino acids
10		Industrial production of antibiotics, vitamins
11	Unit 2	Microbial spoilage of food
12		Physical spoilage
13		Spoilage of food products
14		Spoilage of vegetables, milk, meat
15		Food borne diseases
16		Food borne diseases
17		Food preservation
18		Food preservation, asepsis, pasteurization
19		Canning, desiccation, low temperature, filtration
20		Chemical methods of food preservation
21	Applications and production of SCP	
22	Unit 3	Soil Microbiology - Introduction
23		Physical characteristics of soil
24		Chemical characteristic of soil
25		Estimation of soil microflora
26		Soil fertility and management
27		Rhizosphere and Phyllosphere
28		Microbial diseases of crops -wheat, rice
29		VAM and its importance
30		Nitrogen fixation
31		Types of Nitrogen fixation
32	Biofertilizers	
33		Mass cultivation of Rhizobium, Azotobacter
34		Blue green algae as biofertilizer
35		Concept of environment
36		Microbes in environment
37		Physiological adaptation

38	Unit 4	Microbial pollution - soil
39		Microbial pollution - water
40		Microbial pollution -air
41		Microbial interactions
42		Neutralism
43		Commensalism
44		Synergism
45		Unit 5
46	Biomagnification	
47	Bioleaching	
48	Biopesticides	
49	Microbial H ₂ production	
50	Microbial H ₂ production	
51	Genetically modified organisms	
52	Biodegradation of plastics	
53	Waste disposal	
54	Types of solid and liquid waste	
55	Sewage treatment	
56	Sewage treatment	
57	Sewage treatment	

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Paper II - Immunology & Medical Microbiology		
Teacher - Zahabiya Saifee		
Day/Lecture	Unit	Topic
1	I	Cells of immune system
2		Organs of immune system
3		Innate & aquired immunity
4		MHC- types, structure & function
5		Antigen processing & presentation
6		Humoral immune response
7		Cell mediated immune response
8	II	Structure & properties of antigens
9		Haptens & adjuvants
10		Immunoglobulins structure
11		Types & properties of Ig
12		Antibody diversity & production
13		Antigen antibody interaction
14		Agglutination
15		Precipitation
16		Immunofluorescence, ELISA
17		Radioimmunoassays
18		Hybridoma technology
19		Production & applications of monoclonal antibodies
20	III	Tumor immunology & antigens
21		Tumor antigens, immune response to tumor
22		Tumor evasion of immune system
23		Immune diagnosis of tumor
24		Immune diagnosis of tumor
25	IV	Immunization
26		Modern methods of vaccine production
27		Autoimmunity
28		Hypersensitivity
29		Types of hypersensitivity
30		Antigens of ABO & Rh blood group system
31		Medical importance of blood group
32		Host microbe interaction
33		Mechanism of pathogenecity
34		Diagnosis of infective syndrome
35		Bacterial & viral diseases- Syphilis

36	V	Bacterial & viral diseases- pox
37		Bacterial & viral diseases- hepatitis
38		Fungal disease- Crptococcus
39		Fungal disease- Candidiasis
40		Fungal disease- Dermatomycosis
41		Sexually transmitted diseases

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Practicals	
Teacher - Zahabiya Saifee	
Day/Lecture	Topic
1	Isolation and enumeration of microorganisms from air
2	Isolation and enumeration of microorganisms from air
3	Isolation and enumeration of microorganisms from water
4	Isolation and enumeration of microorganisms from water
5	Isolation and enumeration of microorganisms from soil
6	Isolation and enumeration of microorganisms from soil
7	Total count of bacteria from water
8	Total count of bacteria from water
9	Measurement and confirmation of <i>E.coli</i> in water sample
10	Measurement and confirmation of <i>E.coli</i> in water sample
11	Isolation and identification of bacteria from spoiled food
12	Isolation and identification of bacteria from spoiled food
13	Heavy metal sensitivity in microbes
14	Heavy metal sensitivity in microbes
15	Study of Rhizobium bacteria from root nodules
16	Study of symbiotic and non-symbiotic blue-green algae
17	Study of symbiotic and non-symbiotic blue-green algae
18	Determination of milk quality by Resazurin test through MBRT
19	Determination of Blood groups
20	Estimation of hemoglobin by Sahli's method
21	Estimation of hemoglobin by Cynomethemoglobin method
22	Total count of W.B.C.
23	Total count of R.B.C.
24	Differential W.B.C. count
25	Flocculation reaction-VDRL test
26	Agglutination reaction- Widal test
27	mination of urine- chemical, physical, microscopic and bacteriological
28	mination of urine- chemical, physical, microscopic and bacteriological
29	Demonstration of ELISA test