

RAMANRAIN RUIA AUTONOMOUS COLLEGE

DEPARTMENT OF MICROBIOLOGY

Internal Class test Syllabus Microbiology

2020-21

Paper Code	Syllabus for Internal Class test		
	SYBSc		
RUSMIC 301	2.3	Structure of DNA: Different 3D forms and unusual structures DNA methylation	
	2.4	Structure of chromosomes	
	2.5	Structure of RNA	
		Gene Expression in Bacteria	
	3.1	Central dogma of Molecular Biology	
	3.2	Transcription in prokaryotes a) RNA biosynthesis b) Prokaryotic transcription i. Prokaryotic promoters ii. Initiation, elongation and termination	
	3.3	Translation a) Components of protein synthesis apparatus: Genetic code, mRNA, Ribosomes b) Degeneracy of genetic code c) Protein synthesis	
	3.4	Comparison of eukaryotic & prokaryotic transcription & translation	
	3.5	Introduction to the concept of Omics: Genomics and Proteomics	

RUSMIC 302		Fractionation of microbial cells and separation techniques
	2.1	Disintegration of cells
		<ul style="list-style-type: none"> a) Physical methods b) Chemical methods
	2.2	Separation Techniques
		<ul style="list-style-type: none"> a) Centrifugation techniques: <ul style="list-style-type: none"> i. Basic principles of sedimentation ii. Types of centrifuges and their use: preparative & analytical, ultracentrifuges iii. Density Gradient & isopycnic centrifugation
		<ul style="list-style-type: none"> b) Electrophoretic techniques: <ul style="list-style-type: none"> i. General Principles ii. Factors affecting electrophoresis iii. Support media- Agarose gels and PAGE
	<ul style="list-style-type: none"> c) Chromatographic Techniques: <ul style="list-style-type: none"> i. General principles ii. Types and applications- Partition, adsorption, ion exchange, affinity and size exclusion iii. Modes- Paper, TLC, HPLC, GC, Reverse Phase 	
RUSMIC 303		Air & Fresh Water Microbiology
	1.1	Air Microbiology
		<ul style="list-style-type: none"> a) Origin, distribution, number and kinds of microorganisms in air, Factors affecting microbial survival in air b) Enumeration of microorganisms in air: Impingement in liquids, Impaction on solids, Filtration, Sedimentation, Centrifugation, Electrostatic Precipitation. c) Air borne pathogens and diseases, droplets and droplet nuclei d) Air sanitation- methods and application

	<table border="1"> <tr> <td data-bbox="354 201 440 243">1.2</td> <td data-bbox="440 201 1388 243">Fresh water microbiology</td> </tr> <tr> <td data-bbox="354 243 440 684"></td> <td data-bbox="440 243 1388 684"> <ul style="list-style-type: none"> a) General: Groups of natural waters, factors affecting kinds of microorganisms found in aquatic environments and nutrient cycles in aquatic environments b) Fresh Water environments and microorganisms found in Lakes, ponds, rivers, marshes, bogs and springs c) Potable water: Definition, water purification and pathogens transmitted through water. d) Microorganisms as indicators of water quality e) Bacteriological examination of water-sampling, routine analysis, SPC, membrane filter technique, Standards for water quality </td> </tr> </table>	1.2	Fresh water microbiology		<ul style="list-style-type: none"> a) General: Groups of natural waters, factors affecting kinds of microorganisms found in aquatic environments and nutrient cycles in aquatic environments b) Fresh Water environments and microorganisms found in Lakes, ponds, rivers, marshes, bogs and springs c) Potable water: Definition, water purification and pathogens transmitted through water. d) Microorganisms as indicators of water quality e) Bacteriological examination of water-sampling, routine analysis, SPC, membrane filter technique, Standards for water quality 																
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<p>RUSMIC 501</p>	<table border="1"> <tr> <td colspan="2" data-bbox="354 863 1388 905" style="text-align: center;">DNA Replication</td> </tr> <tr> <td data-bbox="354 905 500 936">2.1</td> <td data-bbox="500 905 1388 936">Historical perspective</td> </tr> <tr> <td data-bbox="354 936 500 1146"></td> <td data-bbox="500 936 1388 1146"> <ul style="list-style-type: none"> a) Conservative b) Dispersive c) Semi-conservative d) Bidirectional e) Semi-discontinuous DNA replication </td> </tr> <tr> <td data-bbox="354 1146 500 1178">2.2</td> <td data-bbox="500 1146 1388 1178">Prokaryotic DNA replication</td> </tr> <tr> <td data-bbox="354 1178 500 1283"></td> <td data-bbox="500 1178 1388 1283">Details of molecular mechanism involved in Initiation, Elongation and Termination</td> </tr> <tr> <td data-bbox="354 1283 500 1314">2.3</td> <td data-bbox="500 1283 1388 1314">Enzymes and proteins associated with DNA replication</td> </tr> <tr> <td data-bbox="354 1314 500 1608"></td> <td data-bbox="500 1314 1388 1608"> <ul style="list-style-type: none"> a) Primase b) Helicase c) Topoisomerase d) SSB e) DNA polymerases f) Ligases g) Ter and Tus proteins </td> </tr> <tr> <td data-bbox="354 1608 500 1640">2.4</td> <td data-bbox="500 1608 1388 1640">Eukaryotic DNA replication</td> </tr> <tr> <td data-bbox="354 1640 500 1755"></td> <td data-bbox="500 1640 1388 1755"> <ul style="list-style-type: none"> a) Molecular details of DNA synthesis b) Replicating the ends of the chromosomes </td> </tr> <tr> <td data-bbox="354 1755 500 1787">2.5</td> <td data-bbox="500 1755 1388 1787">Rolling circle mode of replication</td> </tr> </table>	DNA Replication		2.1	Historical perspective		<ul style="list-style-type: none"> a) Conservative b) Dispersive c) Semi-conservative d) Bidirectional e) Semi-discontinuous DNA replication 	2.2	Prokaryotic DNA replication		Details of molecular mechanism involved in Initiation, Elongation and Termination	2.3	Enzymes and proteins associated with DNA replication		<ul style="list-style-type: none"> a) Primase b) Helicase c) Topoisomerase d) SSB e) DNA polymerases f) Ligases g) Ter and Tus proteins 	2.4	Eukaryotic DNA replication		<ul style="list-style-type: none"> a) Molecular details of DNA synthesis b) Replicating the ends of the chromosomes 	2.5	Rolling circle mode of replication
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RUSMIC 502	Chemotherapy of infectious agents	
	4.1	Introduction to Chemotherapeutic agents
		<ul style="list-style-type: none"> a) Attributes of an ideal chemotherapeutic agent and related definitions b) Selection and testing of antibiotics for bacterial isolates by Kirby-Bauer method and other assays (E-test & Checker Board Assay)
	4.2	Mode of action of antibiotics
		<ul style="list-style-type: none"> a) Cell wall (Beta-lactams- Penicillin and Cephalosporins, Carbapenems) b) Cell Membrane (Polymyxin and Imidazole) c) Protein Synthesis (Aminoglycosides-Streptomycin, Macrolide (Tetracycline and Chloramphenicol) d) Nucleic acid (Quinolones, Nalidixic acid, Rifamycin) e) Enzyme inhibitors (Sulfa drugs, Trimethoprim)
	4.3	List of common antibiotics used for treating viral, fungal and parasitic diseases, New antibiotics
4.4	Mechanisms of drug resistance- Its evolution, pathways and origin	
RUSMIC 503	Methods of Studying Metabolism & Catabolism of Carbohydrates	
	3.1	Experimental Analysis of metabolism
		<ul style="list-style-type: none"> a) Goals of the study b) Levels of organization at which metabolism is studied. c) Metabolic probes d) Use of radioisotopes in biochemistry <ul style="list-style-type: none"> i. Pulse labelling ii. Assay & study of radio respirometry –to differentiate EMP & ED e) Use of biochemical mutants. f) Sequential induction technique
	3.2	Catabolism of Carbohydrates
	<ul style="list-style-type: none"> a) Breakdown of polysaccharides – glycogen, starch, b) cellulose. c) Breakdown of oligosaccharides– lactose, maltose, sucrose, cellobiose d) Utilization of monosaccharides – fructose, 	

	<p>Galactose.</p> <p>e) Major pathways-</p> <ul style="list-style-type: none"> i. Glycolysis (EMP) ii. HMP Pathway & Significance of the pathway iii. ED pathway, iv. TCA cycle & Significance of the cycle v. Anaplerotic reactions vi. Glyoxylate bypass, vii. Incomplete TCA in anaerobic bacteria viii. Amphibolic role of EMP and TCA cycle ix. Energetics of Glycolysis, ED and TCA- <p>Balance sheet and efficiency calculation</p>																
<p>RUSMIC 504</p>	<table border="1"> <tr> <td colspan="2" data-bbox="358 674 1382 716" style="text-align: center;">Upstream Processing</td> </tr> <tr> <td data-bbox="358 716 461 747" style="text-align: center;">1.1</td> <td data-bbox="461 716 1382 747">Strains and Strain Improvement of industrial microorganisms</td> </tr> <tr> <td data-bbox="358 747 461 921"></td> <td data-bbox="461 747 1382 921"> <ul style="list-style-type: none"> a) Isolation of industrially important microorganisms b) Improvement of industrial microorganisms <ul style="list-style-type: none"> i. Selection of induced mutants for primary metabolites ii. Isolation of induced mutants for secondary metabolites </td> </tr> <tr> <td data-bbox="358 921 461 953" style="text-align: center;">1.2</td> <td data-bbox="461 921 1382 953">Sterilization</td> </tr> <tr> <td data-bbox="358 953 461 1142"></td> <td data-bbox="461 953 1382 1142"> <ul style="list-style-type: none"> a) Introduction to the concept of media sterilization and Naba factor b) Design and methods of batch sterilization c) Design and methods of continuous sterilization </td> </tr> </table>	Upstream Processing		1.1	Strains and Strain Improvement of industrial microorganisms		<ul style="list-style-type: none"> a) Isolation of industrially important microorganisms b) Improvement of industrial microorganisms <ul style="list-style-type: none"> i. Selection of induced mutants for primary metabolites ii. Isolation of induced mutants for secondary metabolites 	1.2	Sterilization		<ul style="list-style-type: none"> a) Introduction to the concept of media sterilization and Naba factor b) Design and methods of batch sterilization c) Design and methods of continuous sterilization 						
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RPSMIC 302	1.1 Defense against infectious agents
	<ul style="list-style-type: none"> b. Bacterial infections c. Fungal infections
	4.1 Techniques in Immunology
	<ul style="list-style-type: none"> a) Estimation of antibodies and antigens Revision of Immunoprecipitation, Agglutination and solid Phase assays b) Cellular Techniques <ul style="list-style-type: none"> i. Flow Cytometry ii. Fluorescence-activated cell sorting (FACS) iii. Immunohistochemistry
	4.3 Vaccines
<ul style="list-style-type: none"> a) Newer approaches to vaccine development b) Malarial vaccine 	
RPSMIC 303	Microbiology of fermented and non-fermented foods
	1.1 Basic concepts of Food Microbiology
	Revision of <ul style="list-style-type: none"> a) Sources of microbes in food b) Normal microbiological quality of food c) Factors influencing microbial growth in food
	1.2 Production of fermented foods
	<ul style="list-style-type: none"> a) Starter cultures b) Fermented meat product- Sausage c) Fermented vegetable products- Soy sauce, d) Fermented milk product- Blue and Swiss cheese e) Fermented cereal product – Idli
	1.3 Nutraceuticals and Probiotics
	<ul style="list-style-type: none"> a) Microbial fructooligosaccharides b) Probiotics and Prebiotics <ul style="list-style-type: none"> i. Probiotics ii. Screening of Potential Probiotics iii. Industrial Aspects of Probiotic Production iv. Prebiotics
1.4 Non- fermented food products	
<ul style="list-style-type: none"> a) Desiccated foods b) Dehydrated foods 	

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