

CONTENT

1.	INTRODUCTION OF MICROBIOLOGY	7
2.	HISTORY OF MICROBIOLOGY	8
3.	MICROBIAL ECOSYSTEM	10
4.	MICROBIAL DIVERSITY	10
5.	STRUCTURE AND ACTIVITIES OF MICROBIAL CELLS	11
6.	VIRUSES AND VIROLOGY	13
6.1	Virus taxonomy	14
2.2	Virus replication	15
6.3	Bacteriophages.....	17
6.4	Plant and Animal Viruses	18
7.	ELEMENTS OF MICROBIAL STRUCTURE	19
7.1	Cell wall of prokaryote - bacteria	20
7.2	Cell wall of eukaryote.....	22
7.3	Cell (plasma) membrane.....	22
7.4	Mesosome	23
7.5	Cytoplasm.....	23
7.6	Ribosomes.....	23
7.7	Genes, Genomes, Nucleus, and Nucleoid.....	23
7.8	Plasmid	24
7.9	Endoplasmic reticulum	24
7.10	Golgi complex	25
7.11	Mitochondria.....	25
8.	ACTIVITIES OF MICROBIAL CELLS.....	25
8.1	DNA replication.....	26
8.2	Gene transfer and recombination.....	28
8.3	Nutrient transport.....	29
9.	CELLS OF BACTERIA - CELL MORPHOLOGY	30
9.1	Components External to the Cell Wall	31
9.1.1	Capsules, Slime Layers, and S-Layers	31
9.1.2	Flagella and Motility.....	31
9.1.3	Fimbriae and Pili.....	32
9.2	Endospore forming bacteria.....	32
10.	MICROMYCETES - YEASTS AND MOULDS	33
10.1	Zygomycota	36
10.2	Ascomycota	37
10.3	Deuteromycota ("Fungi imperfecti").....	38
10.4	Other genera of fungi:.....	39
11.	MICROBIAL NUTRITION REQUIREMENTS	41
11.1	Bacterial cell composition	41
11.2	Requirements	41
11.3	Classification of microorganism according to carbon sources	42
11.4	Classification of microorganisms according sources of carbon, energy and electrons	42

12. MICROBIAL GROWTH	43
12.1 Characterization of growth curve phases in a closed system (batch culture)	43
12.1.1 Growth characteristics	45
12.1.2 Measurement of microbial growth	45
12.2 Continuous cultivation.....	45
12.3 Culture medium	45
12.4 Extrinsic and Intrinsic growth factors	46
Solute and water activity	46
- pH.....	46
- Oxygen concentration	46
- Temperature	47
13. PRODUCTS OF MICROBIAL METABOLISM	48
13.1 Examples of secondary metabolites of microorganisms	48
13.1.1 Mykotoxins (fungal exotoxins)	48
13.1.2 Antibiotics	50
13.1.3 Bacteriocins	52
13.1.4 Bacterial toxins	53
14. METABOLISM AND ENERGY CYCLE.....	54
- Catalysis and Enzymes.....	55
14.1 Fermentations	56
- Glycolysis.....	58
14.1.1 Lactic acid fermentation	60
14.1.2 Alcoholic fermentation	61
14.1.3 Propionic acid fermentation	61
14.1.4 Butanediol fermentation	62
14.1.5 Mixed acid fermentations	62
14.1.6 Butyric acid fermentation	62
14.1.7 Fermentation by bifidobacteria.....	62
14.2 Practical uses of fermentations	63
How to make silage	63
How to make yogurt	64
How to make cheese	64
Syntrophy	66
Methanogenesis	66
14.3 Respiration.....	67
14.3.1 Aerobic respiration	67
14.3.2 Incomplete aerobic respiration (“false fermentation”)	67
14.3.3 Anaerobic respiration	68
14.4 Nitrogen cycle.....	68
14.4.1 Nitrogen fixation	70
14.4.2 Ammonification.....	71
14.4.3 Nitrification	71
14.4.4 Denitrification (dissimilatory nitrite reduction)	72
14.4.5 Assimilatory nitrate reduction	73

14.5	Catabolic reactions.....	73
14.5.1	Catabolism of polysaccharides and other sugars	73
14.5.2	Lipid catabolism	76
14.5.3	Protein and amino acid catabolism	76
14.6	Anabolism – biosynthesis	77
14.6.1	Photosynthesis	78
14.6.2	Synthesis of saccharides	79
14.6.3	Synthesis of proteins.....	79
14.6.4	Synthesis of lipids.....	80
15.	BACTERIA CLASSIFICATION	81
15.1	Characteristic of bacteria	81
15.2	Description of selected bacterial genera	83
	<i>Bacillus</i> spp.....	83
	<i>Bacteroides</i> spp.....	83
	<i>Bifidobacterium</i> spp.....	83
	<i>Campylobacter</i> spp.	83
	<i>Clostridium</i> spp.....	84
	<i>Enterobacter</i> spp.....	84
	<i>Enterococcus</i> spp.	84
	<i>Escherichia</i> spp.	85
	<i>Lactobacillus</i> spp.....	85
	<i>Lactococcus</i> spp.....	86
	<i>Leuconostoc</i> spp.....	86
	<i>Listeria</i> spp.	86
	<i>Micrococcus</i> spp.	86
	<i>Proteus</i> spp.	87
	<i>Salmonella</i> spp.....	87
	<i>Staphylococcus</i> spp.....	87
	<i>Streptococcus</i> spp.	88
	<i>Propionibacterium</i> spp.	88
	<i>Pseudomonas</i> spp.....	88
	Literature.....	89