

CONTENTS

Abbreviations	vii
Preface	ix
Section A The microbial world	1
A1 The microbial world	1
Section B Systematics	5
B1 Prokaryotic systematics	5
B2 Identification of bacteria	7
B3 Inference of phylogeny from rRNA gene sequence	10
Section C Microbiology	13
C1 Discovery and history	13
C2 Prokaryotic diversity	15
C3 Culture of bacteria in the laboratory	18
C4 Enumeration of microorganisms	21
C5 Looking at microbes	25
C6 The major prokaryotic groups	32
C7 Composition of a typical prokaryotic cell	41
C8 The bacterial cell wall	46
C9 Cell division	52
C10 Bacterial flagella and movement	56
C11 Prokaryotes and their environment	59
Section D Microbial growth	65
D1 Measurement of microbial growth	65
D2 Batch culture in the laboratory	72
D3 Large-scale and continuous culture	76
Section E Microbial metabolism	81
E1 Enzymology	81
E2 Heterotrophic pathways	87
E3 Electron transport, oxidative phosphorylation and β -oxidation of fatty acids	95
E4 Autotrophic reactions	101
E5 Biosynthetic pathways	107
Section F Prokaryotic DNA and RNA metabolism	113
F1 DNA – the primary information macromolecule	113
F2 Genomes	117
F3 Structure of nucleic acids	121
F4 Hybridization	126
F5 DNA replication	132
F6 Transcription	139
F7 RNA and the genetic code	149
F8 Translation	154
F9 Signal transduction and environmental sensing	158
F10 Mutation	162
F11 DNA repair	169
F12 Transfer of DNA between cells	173

F13	Recombination	177
F14	Bacteriophage	181
F15	Plasmids	186
F16	Manipulation of cellular DNA and RNA	189
Section G	Industrial microbiology	201
G1	Prokaryotes in industry	201
Section H	Bacterial infections	205
H1	Human bacterial infections	205
H2	Bacterial infections: types, portals of entry, modes of transmission, contributing factors in their emergence/spread and common features in bacterial infections	217
H3	Pathogenesis and virulence of bacterial infections	222
H4	Bacterial toxins	226
H5	<i>Escherichia coli</i> as a model bacterial pathogen	232
H6	Human defence mechanisms	240
H7	Bacterial evasion of immune defences	244
H8	Control of bacterial infections	248
H9	Bacteria as biological weapons	252
Section I	Eukaryotic microbes: an overview	257
I1	Taxonomy	257
I2	Eukaryotic cell structure	260
I3	Cell division and ploidy	267
Section J	The fungi and related phyla	273
J1	Fungal structure and growth	273
J2	Fungal nutrition	278
J3	Reproduction in fungi	281
J4	Beneficial effects	288
J5	Detrimental effects	292
Section K	Chlorophyta and protista	295
K1	Taxonomy and structure	295
K2	Nutrition and metabolism	304
K3	Life cycles	310
K4	Beneficial effects	318
K5	Detrimental effects	321
K6	Parasitic protista	323
Section L	The Viruses	343
L1	Virus structure	343
L2	Virus taxonomy	348
L3	Virus proteins	353
L4	Virus nucleic acids	359
L5	Cell culture and virus growth	366
L6	Virus assay	370
L7	Virus replication	374
L8	Virus infection	380
L9	Viruses and the immune system	386
L10	Virus vaccines	390
L11	Antiviral chemotherapy	394
L12	Plant viruses	399
L13	Prions and transmissible spongiform encephalopathies	404