

CONTENTS

<i>Preface</i>	v
<i>Acknowledgments</i>	x
<i>Orientation to the Laboratory: Rules of Conduct and General Safety</i>	xi
<i>Summary of Universal Precautions and Laboratory Safety Procedures</i>	xiii

PART ONE

Microscopic Techniques

1. Bright-Field Light Microscope and Microscopic Measurement of Organisms	2
2. The Hanging Drop Slide and Bacterial Motility	13
3. Dark-Field Light Microscope	17
4. Phase-Contrast Light Microscope	21
5. Fluorescence Microscope	27

PART TWO

Bacterial Morphology and Staining

6. Negative Staining	32
7. Smear Preparation and Simple Staining	37
8. Gram Stain	43
9. Acid-Fast Staining (Ziehl-Neelsen and Kinyoun) Procedures	51
10. Endospore Staining (Schaeffer-Fulton or Wirtz-Conklin)	57
11. Capsule Staining	63
12. Flagella Staining: West and Difco's SpotTest Methods	69

PART THREE

Basic Laboratory and Culture Techniques

13. Microbiological Culture Media Preparation and Sterilization	76
14. Culture Transfer Instruments, Techniques, and Isolation and Maintenance of Pure Cultures	83

15. Spread-Plate Technique	93
16. The Streak-Plate Technique and Differential Media	99
17. Pour-Plate Technique	105
18. Cultivation of Anaerobic Bacteria	109
19. Determination of Bacterial Numbers	117

PART FOUR

Biochemical Activities of Bacteria

20. Carbohydrates I: Fermentation and β -Galactosidase Activity	126
21. Carbohydrates II: Triple Sugar Iron Agar Tests	133
22. Carbohydrates III: Starch Hydrolysis	139
23. Lipids: Lipid Hydrolysis	143
24. Proteins, Amino Acids, and Enzymes I: Hydrogen Sulfide Production and Motility	147
25. Proteins, Amino Acids, and Enzymes II: The IMViC Tests	153
26. Proteins, Amino Acids, and Enzymes III: Casein Hydrolysis	161
27. Proteins, Amino Acids, and Enzymes IV: Gelatin Hydrolysis	165
28. Proteins, Amino Acids, and Enzymes V: Catalase Activity	169
29. Proteins, Amino Acids, and Enzymes VI: Coagulase and DNase Activity	173
30. Proteins, Amino Acids, and Enzymes VII: Oxidase Test	179
31. Proteins, Amino Acids, and Enzymes VIII: Urease Activity	185
32. Proteins, Amino Acids, and Enzymes IX: Lysine and Ornithine Decarboxylase Test	189
33. Proteins, Amino Acids, and Enzymes X: Phenylalanine Deamination	195
34. Proteins, Amino Acids, and Enzymes XI: Nitrate Reduction	201

PART FIVE

Rapid Multitest Systems

- 35. The API 20E System 208
- 36. The Enterotube II System 215

PART SIX

Unknown Identification

- 37. Using the First Edition of *Bergey's Manual of Systematic Bacteriology* to Identify Bacteria 224
- 38. General Unknown 229

PART SEVEN

Environmental Factors Affecting Growth of Microorganisms

- 39. Temperature 238
- 40. pH 243
- 41. Osmotic Pressure 247
- 42. The Effects of Chemical Agents on Bacteria I: Disinfectants 251
- 43. The Effects of Chemical Agents on Bacteria II: Antimicrobial Agents (Kirby-Bauer Method) ... 257
- 44. Hand Washing, Environmental Sampling, and Microbiological Monitoring 263
- 45. Determination of a Bacterial Growth Curve: Classical and Two-Hour Method 271

PART EIGHT

Environmental and Food Microbiology

- 46. Standard Coliform Most Probable Number (MPN) Test and Presence-Absence Coliform Test 285
- 47. Membrane Filter Technique for Coliforms and Fecal Streptococci; KONFIRM Test for Fecal Coliforms 291
- 48. Isolation of *Escherichia coli* Bacteriophages from Sewage and Determining Bacteriophage Titers .. 299
- 49. Enumeration of Soil Microorganisms 305
- 50. Bacterial Count of a Food Product 311
- 51. Examination of Milk for Bacteria 315

PART NINE

Medical Microbiology

- 52. Agglutination Reactions: Blood Groups 322

- 53. Isolation of Normal Microbiota from the Human Body 327
- 54. Staphylococci 333
- 55. Pneumococci 341
- 56. Streptococci 347
- 57. Neisseriae 355
- 58. Aerobic and Anaerobic Endospore-Forming Bacteria 361

PART TEN

Survey of Selected Eucaryotic Microorganisms

- 59. Fungi I: Yeasts 368
- 60. Fungi II: Phycomycetes, Ascomycetes, and Basidiomycetes 373

PART ELEVEN

Microbial Genetics and Genomics

- 61. Bacterial Mutation 382
- 62. Bacterial Transformation 387
- 63. Bacterial Conjugation: The Transfer of Antibiotic-Resistant Plasmids 393
- 64. Isolation of Genomic DNA from *Saccharomyces cerevisiae* 399
- 65. Isolation and Purification of Genomic DNA from *Escherichia coli* 403
- 66. Identifying Archaea and Bacteria Using the Internet and Computer-Assisted Gene Analysis .. 409

Appendix A Dilutions with Sample Problems 417

Appendix B Metric and English Measurement Equivalents 427

Appendix C Transmission-Absorbance Table for Spectrophotometry 429

Appendix D Logarithms 430

Appendix E pH and pH Indicators 431

Appendix F Scientific Notation 432

Appendix G Identification Charts 434

Appendix H Reagents, Solutions, Stains, and Tests 439

Appendix I Culture Media 443

Appendix J Sources and Maintenance of Microbiological Stock Cultures 450

Credits 454

Index 455