Contents

Section 1: Applied Microbiology

1. Introduction to Microbiology 3

- Terminology *3*
- Importance and Relevance to Nursing *5*
- Role of Nurse in Microbiology *7*
- Historical Perspective of Microbiology *10*
- Concept of Microbiology *16*
- Microbiology Terminology *16*
- Principles of Microbiology *21*
- Scope of Microbiology *22*
- Applications of Microbiology *23*

2. General Characteristics of Microbes 26

- Terminology *26*
- Structure and Classification of Microbes *27*
- Differences Between Prokaryotes and Eukaryotes *30*
- Bacterial Structure *30*
- Classifications of Bacteria *34*
- Spore *38*
- Flagella *40*
- Bacterial Growth Curve *41*
- Factors Influencing Bacterial Growth *42*
- Environmental Factors *43*
- Nutritional Requirements of Bacteria *44*
- Normal Flora *45*
- Laboratory Methods for Identification of Microorganisms *46*
- Microscope *51*
- Staining *55*
- Gram Staining *57*
- Acid-fast Staining (Ziehl-Neelsen Technique) *58*
- Special-capsular Staining (Negative) *59*
- Demonstration Spores (Endospore Stain) *60*
- Demonstration of Fungal Elements *60*
- Culture and Media *63*
- Isolation of Bacteria in Laboratory *65*
- Inoculation Methods of Culture Media *65*
- Incubation *66*
- Anaerobic Culture Methods *67*
- Identification of Bacteria *68*
- Preservation of Microorganism *69*

3. Pathogenic Organisms 73

Bacteriology 73

- Terminology *73*
- Definition *74*
- History of Bacteriology *74*
- Gram-positive Bacteria *75*
- Gram-negative Bacteria *76*
- Difference Between Cocci and Bacilli *77*
- *Staphylococcus* *78*
- *Streptococcus* *80*
- *Neisseria* *83*
- *Neisseria meningitidis* *85*
- *Corynebacterium* *88*
- *Corynebacterium diphtheriae* *88*
- Bacillus Anthracis *90*
- Enterobacteriaceae *93*
- *Escherichia* *93*
- *Klebsiella* *96*
- *Proteus* *97*
- *Salmonella* *99*
- Shigella *102*
- *Mycobacterium* (*tuberculosis* and *leprosy*) *104*
- *Mycobacterium tuberculosis* *105*
- *Mycobacterium leprae* *108*
- Vibrios *110*
- *Vibrio cholerae* *110*
- *Spirochaetes* *112*
- *Treponema pallidum* (Syphilis) *112*
- *Mycoplasma* *114*
- *Rickettsia* *116*
- *Clostridium* *119*

- *Clostridium tetani* 119
- *Yersinia* 121
- Plague 122
- *Campylobacter* 124
- *Helicobacter pylori* 126
- Spiral Bacteria 127
- *Leptospira* 127

***Viruses* 129**
- Terminology 129
- Concept of Viruses 130
- Difference Between Bacteria and Virus 130
- Pioneers of Virology 130
- Morphology of Viruses 131
- Structure of Viruses 133
- Viral Replication and Replication Cycle 134
- Properties of Viruses 135
- Classification of Viruses 136
- Difference Between DNA and RNA Viruses 138
- Methods of Cultivation of Viruses 138
- Laboratory Diagnosis of Virus Diseases 140
- Diseases Caused due to Viruses 142
- Corona Virus 142
- Herpesvirus 146
- Herpes Simplex Viruses 147
- Varicella-Zoster Virus 149
- Cytomegalovirus 151
- Epstein-Barr Virus 153
- Smallpox Viruses 154
- Hepatitis Viruses 156
- Hepatitis B Virus 156
- Hepatitis C Virus 158
- Hepatitis D 160
- Hepatitis E 161
- Human Immunodeficiency Virus and AIDS 162
- Polio Virus 168
- Rhabdovirus 170
- Rabies Virus 170
- Flaviviruses 173
- Dengue 174
- Chikungunya 176
- Rhinoviruses 178

***Fungi* 180**
- Morphology of Fungi 182
- Habitat of Fungi 182
- Classification of Fungi 182
- Examples of Fungi 183
- Structure of Fungi 184
- Differences Between Bacteria and Fungi 184
- Characteristics of Fungi 184
- Classification of Fungi 184
- Reproduction in Fungi 186
- Uses of Fungi 186
- Fungal Life Cycle 187
- Importance of Fungi 188
- Laboratory Diagnosis of Fungal Infections 188
- Mycosis 191
- Superficial Mycosis 194
- Dermatophyte 197
- Subcutaneous Mycosis 198
- Deep/Systemic Mycoses 202
- Histoplasmosis 204
- Paracoccidioidomycosis 205
- Coccidioidomycosis 206
- Cryptococcosis 206
- Opportunistic Mycosis 207
- Aspergillosis 208
- *C. albicans* 208
- Mucormycosis 209

***Parasites* 212**
- Definition 213
- History of Parasitology 214
- Concept of Parasitology 214
- Different Kinds of Parasites 215
- Sources of Parasitic Infection or Infestation 215
- Host in Parasitology 216
- Difference Between Host and Parasites 217
- Pathogenesis of Parasitic Infections 217
- Prevention and Control 218
- Laboratory Diagnosis of Parasites 218
- *Entamoeba histolytica* 218
- *Giardia lamblia* 222
- *Trichomonas vaginalis* 224
- Hemoflagellates: *Leishmania donovani* 226
- Sporozoa: *Plasmodium* 228
- *Wuchereria bancrofti* 231
- Lymphatic Filariae 231
- Cestodes 233
- Opportunistic Protozoa 234

***Rodents and Vectors* 235**
- Rodents 236
- Diseases from Wild Rodents 237
- *Yersinia Pestis* 237
- *Pasteurella* 239
- *Francisella* 240
- Vectors 240
- Diseases Caused by Insects 242
- Effects of Arthropods 246
- Rickettsiae 247

- *Ehrlichia* *247*
- *Coxiella* *248*
- *Bartonella* *249*
- *Orientia* (Rickettsia) *tsutsugamushi* and Scrub Typhus *249*
- *Coxiella burnetii* and Q Fever *250*

4. Immunity 260

- Terminology *260*
- Definition *262*
- Immune System *263*
- Lines of Defense *266*
- Factors Influencing Immunity *268*
- Types of Immunity *269*
- Mechanism of Innate Immunity *270*
- Acquired Immunity *271*
- Common Disorders of the Immune System *273*
- Antigen and Antibody Reaction *273*
- Agglutination *275*
- Precipitation *276*
- Complement Fixation Test *277*
- Enzyme-linked Immunosorbent Assay *278*
- Radioimmunoassay *279*
- Western Blotting *279*
- Chemiluminescence Immunoassay *280*
- Immunochromatography Assay *280*
- Hypersensitivity Reactions *280*
- Type I Hypersensitivity *281*
- Type II Hypersensitivity *283*
- Type III Hypersensitivity *284*
- Type IV Hypersensitivity (Cell Mediated) Hypersensitivity *285*
- Serological Tests *286*
- Immunoglobulins *290*
- Classes of Immunoglobulins *291*
- Vaccines *295*
- Storage and Handling of Vaccines *298*
- Cold Chain *303*
- Immunization for Various Diseases *304*
- National Immunization Programme *304*
- COVID-19 Vaccine *304*
- Immunology and Nursing *307*

Section 2: Infection Control and Patient Safety

5. Hospital-acquired Infection 313

- Terminology *313*
- Definition *314*
- Causes of Nosocomial Infection *314*
- Types of HAI *315*
- Sources of Infection *316*
- Modes of Transmission *316*
- Common Hospital-acquired Infections *317*
- Diagnosis and Preventive Measures in HAI *317*
- Bundle Approach *320*
- Prevention of Urinary Tract Infection *325*
- Prevention of Surgical Site Infection *326*
- Prevention of Ventilator-associated Events *327*
- Prevention of Central Line-Associated Blood Stream Infection *328*
- Surveillance of HAI *329*
- Infection Control Team *330*
- Infection Control Committee *332*
- Role of Infection Control Nurse *333*

6. Isolation Precautions and Use of Personal Protective Equipment 337

- Definition *338*
- Isolation Precautions *338*
- Contact Precautions *338*
- Droplet Precautions *339*
- Airborne Precautions *340*
- Standard Precautions *341*
- Infection Control Precautions *342*
- Transmission-based Precautions (Direct Contact, Droplet, Indirect) *345*
- Epidemiology and Infection Prevention *346*
- Personal Protective Equipment *347*
- Barrier Nursing *351*

7. Hand Hygiene 355

- Terminology *355*
- Definition *356*
- Aim of Hand Wash *356*
- Normal Flora in the Skin *356*
- Types of Hand Hygiene *356*
- Indications *356*
- Hand Hygiene Practices *357*
- Types/Methods of Hand Hygiene *357*
- Alcohol Hand Rub *358*
- Antiseptic Handwash *359*
- Surgical Antisepsis *359*
- Complications of Poor Hand Hygiene *360*
- Benefits of Hand Hygiene Maintenance *360*
- Moments of Hand Hygiene *361*
- Hand Contamination and Decontamination *362*
- WHO Hand Hygiene Promotion *363*

8. Disinfection and Sterilization 366

- Terminology *366*
- Definition *367*
- Difference Between Disinfection and Sterilization *367*
- Physical Methods of Sterilization *367*
- Dry Heat *368*
- Moist Heat *369*
- Radiation *372*
- Filtration *372*
- Sonic and Ultrasonic Vibrations *374*
- Chemical Methods of Disinfection *374*
- Disinfectants *374*
- Alcohols *376*
- Aldehydes *376*
- Phenol *376*
- Halogens *377*
- Heavy Metals *378*
- Surface Active Agents *378*
- Dyes *378*
- Hydrogen Peroxide *378*
- Gaseous Sterilization *379*
- Ethylene Oxide *379*
- Beta-Propiolactone *379*
- Physiochemical Method *379*
- Testing of Disinfectants *379*
- Environment Cleaning *380*
- Equipment Cleaning *382*
- Spaulding's Principle *383*
- Guides on Use of Disinfectants *384*

9. Specimen Collection 388

- Terminology *388*
- Definitions *389*
- Concepts for Specimen Collection *389*
- Principles of Specimen *389*
- Collection of Specimens: General Information *390*
- General Guidelines For Proper Specimen Collection *390*
- Sample Collection Preparation *391*
- Specimen Collection *391*
- Preservation, Storage and Transport of Specimens *392*
- Urine Collections from Catheter *392*
- Hours Urine Collection *393*
- Urine Culture *394*
- Stool-Routine and Culture *394*
- Sputum Culture *395*
- Blood Smear *396*
- Blood Culture *397*
- Throat Swab *398*
- Vaginal Swab/Smear *399*
- Urine Testing *400*
- Staff Precautions in Handling Specimens *402*

10. Biomedical Waste Management 406

- Terminology *406*
- Definitions *407*
- Objectives of BMW *407*
- Concept of Biomedical Waste *408*
- Classification of Hospital Waste *409*
- Ill-Effects of Biomedical Waste *409*
- Principles of Biomedical Waste Management *409*
- Methods of Biomedical Waste Management *411*
- Staff Precautions in BMW Management *412*
- BMW National Guidelines 2017 *413*
- Nurses' Role and Responsibility in BMW *414*
- Laundry Management Process and Infection Control and Prevention *415*
- Laundry Management *416*
- Laundry Person Duties *418*

11. Antibiotic Stewardship 421

- Terminology *421*
- Definition *422*
- Aim of Ams Program *422*
- Need and Importance *423*
- Program Components *423*
- Elements of Hospital Antibiotic Stewardship Programs *424*
- Leadership Commitment *424*
- Implement Policies and Interventions to Improve Antibiotic Use *426*
- Tracking and Reporting Antibiotic Use and Outcomes *426*
- Education *427*
- Emerging Developments in Antibiotic Stewardship *427*
- Antimicrobial Resistance *427*
- Methicillin-resistant *Staphylococcus aureus* *431*
- Multidrug-resistant Organisms *432*
- Prevention of MRSA, MDRO in Healthcare Setting *433*
- Nurses Role in Antibiotic Stewardship *433*

12. Patient Safety Indicators 436

- Terminology *436*
- Common Treats to Patient Safety *437*
- Concept of Patient Safety *439*
- Care of Vulnerable Patients *440*
- Prevention of Iatrogenic Injury *441*
- Care of Lines, Drains and Tubings *442*
- Restrain Policy and Care–Physical and Chemical *442*
- Blood and Blood Transfusion Policy *443*
- Prevention of IV Complication *444*
- Prevention of Fall *447*
- Prevention of DVT *447*
- Shifting and Transporting of Patients *449*
- Surgical Safety *450*
- Care Coordination Event Related to Medication Reconciliation and Administration *451*
- Prevention of Communication Errors *453*
- Prevention of HAI *454*
- Documentation *455*

13. Incidents and Adverse Events 458

- Terminology *458*
- Definition *459*
- Concept of Adverse Events *460*
- Capturing Incidents *461*
- Serious Adverse Event *462*
- Key Characteristics of Accident/Error *463*
- Risk Assessment Screening Criteria *463*
- Clinical Risk Management Team *464*
- Identification of Adverse Health Events *464*
- Root Cause Analysis *465*
- Action Plans Development *468*
- Reporting System *468*
- Incidents Reporting *468*
- Corrective and Preventive Actions *469*
- Report Writing *471*

14. International Patient Safety Goals 474

- Terminology *474*
- Concept of IPSGs *475*
- National Patient Safety Goals for Hospitals *476*
- Identify Patients Correctly *476*
- Improve Effective Communication *478*
- Improve the Safety of High-Alert Medications *480*
- Ensure Correct Site, Correct Procedure, Correct Patient Surgery *483*
- Reduce Risk of Healthcare-associated Infections *485*
- Reduce the Risk of Patient Harm Resulting from Fall *487*
- Reduce the Harm Associated with Clinical Alarm System *491*
- National Patient Safety Goals for Nursing Care *492*

15. Safety Protocol 494

- Terminology *494*
- High 5S: Action on Patient Safety *495*
- Radiation Safety *498*
- Laser Safety *498*
- Fire Safety *500*
- Fire Alarms *502*
- Firefighting Equipment *502*
- Hazmat Safety *503*
- Types of Spill and Spillage Management *503*
- Material Safety Data Sheet *506*
- Environmental Safety *506*
- Risk Assessment *509*
- Aspect Impact Analysis *509*
- Maintenance of Temperature and Humidity (Department-wise) *510*
- Audits *510*
- Emergency Codes *511*
- Role of Nurse in Times of Disaster *511*

Index *515*