

Contents

<i>Foreword</i>	vii
<i>Preface to the Fourth Edition</i>	ix
<i>Preface to the Third Edition</i>	x
<i>Contributors</i>	xvii
<i>Commonly Used Abbreviations in Medical Laboratories</i>	xix

SECTION 1: INTRODUCTION

1. Human Health and Clinical Diagnosis in Developing Countries	3
<i>Kanai L Mukherjee, Swarajit Ghosh and Chhotelaal Pande</i>	
Human Body in Health and Disease	3
Medical Care in India	4
Healthcare in India	6
Clinical Laboratories and Laboratory Personnel in India	7
Status of Medical Laboratories in Developing Countries	11
Commonly Requested Laboratory Tests in India and Other Developing Countries	12
Review Questions	14
2. Introduction to Clinical Laboratories	16
<i>Ashoke Khanwalkar and Chhotelaal Pande</i>	
Introduction to Clinical Laboratories	16
Organization of Clinical Laboratories	17
Ethics and Laboratory Medicine	24
Automation in Clinical Laboratories	25
Review Questions	28
3. Laboratory Safety and First Aid	29
<i>Monisha Bhatia</i>	
Clinical Laboratory Environment	30
Laboratory Safety Policies	30
Biohazard and Safety Precautions	37
Radiation Hazard	40
Fire Hazard and Explosion	40
Specialized Equipment	43
Laboratory Hygiene and Housekeeping	45
Personal Safety of Laboratory Workers	45
Warning Signs	47
Accident Record and Training	47
First Aid Kits and Procedures	48
Poisoning with Strong Acids and Caustic Alkalis	51
Guide to Standard Precautions	53
Review Questions	53

4. Introduction to Laboratory Equipment and Basic Laboratory Operations	54
<i>Kanai L Mukherjee and Piyali Basu</i>	
Overview	55
Identification and Use of Common Laboratory Glassware and Equipment	55
Use and Care of Laboratory Glassware and Plastic Ware	58
Techniques of Simple Laboratory Operation	59
Storage, Handling and Preparation of Laboratory Reagents	87
Techniques for Heating a Liquid in a Test Tube	92
Graphical Presentation of Data	93
Use and Care of Common Laboratory Instruments	95
Laboratory Water	122
Water for Human Consumption	127
Common Laboratory Equipment	129
Special Laboratory Equipment	132
Review Questions	139
5. Specimen Handling and Laboratory Records	140
<i>Chhotelaal Pande, Anant Kumar Pandey</i>	
Overview	141
Collection and Pre-Analytical Handling of Specimens	141
Procedures for Common Laboratory Specimens	145
Mailing Laboratory Specimen	170
Reporting of Laboratory Results	171
Discarding Specimens after Use	174
Clinical Laboratory Records	174
Review Questions	180
Appendix: Sample Copies of Laboratory Forms and Records	182
6. Units of Measurement and Preparation of Reagent Solutions	196
<i>Tara Chatteraj</i>	
International System of Measurement: The Metric System	196
Units of Measurement	198
Preparation of Reagent Solutions	203
Laboratory Calculations	207
Review Questions	210
7. Good Laboratory Practices and Statistical Quality Control	212
<i>Aloka Chakravarty</i>	
Sources of Common Errors in Laboratory	213
Proficiency Testing	214
Statistical Quality Control of Quantitative Data	218
Basic Statistics	218
Summary	226
Review Questions	226

SECTION 2: HAEMATOLOGY AND COAGULATION

8. Introduction to Haematology	229
<i>Anuradha Chakravathy</i>	
Introduction	229
Components of Blood and Their Functions	230
Haematopoietic System of the Body	232
Review Questions	235

9. Basic Laboratory Procedures in Haematology	236
<i>Anuradha Chakravarthy</i>	
Overview	236
Collection and Processing of Blood Specimen	236
Preparation of Blood Films	238
Cleaning of Laboratory Glassware in Haematology	241
Review Questions	241
10. Routine Haematological Tests	242
<i>Anuradha Chakravarthy and Volkmar Dierolf</i>	
Determination of Haemoglobin Concentration	243
Determination of Haematocrit	252
Red Blood Cell Indices	258
Interpretation of Abnormal Findings	261
Erythrocyte Sedimentation Rate (ESR)	262
Enumeration of Formed Elements	266
Microscopic Study of Blood Smear	271
Automated Systems in Haematology	292
Reticulocyte Count	296
Absolute Platelet Count	300
Review Questions	304
11. Special Haematological Test	306
<i>Anuradha Chakravarthy</i>	
Laboratory Diagnosis of Haemoglobinopathies	306
Screening Test for Sickle Cell Anaemia	307
Laboratory Diagnosis of Blood Parasite Infection	313
Review Questions	331
12. Interpretation of Laboratory Findings in Haematology	332
<i>Anuradha Chakravarthy</i>	
Overview	333
Anaemias	333
Leukaemias	334
Miscellaneous Disorders	336
Review Questions	337
13. Introduction to Haemostasis and Haemostatic Disorders	338
<i>Ritwik Bhatia</i>	
Haemostasis (Stoppage of Bleeding)	339
Mechanism of Blood Coagulation	341
Fibrinolysis	342
Disorders of Haemostasis	343
Control Mechanisms of Haemostasis	345
Laboratory Tests for Haemostatic Function	346
Review Questions	346
14. Laboratory Investigation of Bleeding Disorders	348
<i>Ritwik Bhatia</i>	
Basic Screening Tests for Bleeding Disorders	349
Coagulation Tests	356
Determination of Activated Partial Thromboplastin Time	363
Rapid Haemostatic Tests and Point-of-Care Instruments	364

Tests for Fibrin Degradation Products (FDP) or D-Dimer 365
 Protamine Sulphate Test 366
 Laboratory Diagnosis of Bleeding Disorders 366
 Therapy of Bleeding Disorders 369
 Review Questions 370

SECTION 3: IMMUNOHAEMATOLOGY OR BLOOD BANKING

15. Introduction to Blood Transfusion Therapy 373
Pampee Paul Young and Jay S Raval
 Basic Concepts of Immunology and Immunohaematology 374
 Discovery of Basic Human Blood Groups (ABO) 376
 Principles of Immunohaematology 378
 Red Cell Antigens 378
 Recognition of Immunologic Reactions of Red Cells 380
 Laboratory Methods in Detecting Antibodies 381
 Human Blood Group Systems 382
 Basic Blood Group System: ABO 382
 Rhesus (Rh) Blood Group System and Immune Antibodies 385
 Other Blood Group Systems 388
 Pretransfusion Testing 389
 Antibody Screen 389
 Compatible Blood Groups 391
 Review Questions 392

16. Collection and Processing of Blood for Transfusion 393
Pampee Paul Young and Jay S Raval
 Selection of Blood Donors 394
 Method of Blood Collection 398
 Transportation of Blood After Collection 404
 Storage of Blood 405
 Common Equipment in a Blood Bank 406
 Reagents 410
 Preparation of Blood Components 411
 Autotransfusion 417
 Plasmapheresis 417
 Transportation of Blood 417
 Delivery of Blood and Blood Components to Clinical Areas 418
 Review Questions 419

17. Routine Laboratory Procedures in Blood Bank 420
Pampee Paul Young and Jay S Raval
 Significance of Quality Control in Blood Bank 421
 Specimen Collection for Blood Bank 421
 General Laboratory Preparations in Blood Bank 422
 Preparation of Laboratory Reagents in Blood Bank 424
 Reporting of Haemagglutination Reaction 426
 ABO Blood Grouping 427
 Rh Blood Typing 437
 Antihuman Globulin (AHG) or Coombs' Test 441
 Major Cross-Match 446
 Antibody Screening Test 452
 Identification of Unexpected Antibodies 453

Titration of Anti-D 454

Review Questions 456

Appendix 17.1: Request for Blood Transfusion 458

18. Blood Transfusion Services and Clinical Approach to Haemolytic Disease of the Newborn	459
<i>Pampee Paul Young and Jay S Raval</i>	
Introduction to Blood Transfusion Services	459
Pretransfusion Testing	460
Release of Blood for Transfusion	461
Blood Transfusion Therapy	462
Transfusion Reactions	462
Haemolytic Disease of the Foetus and/or Newborn	464
<i>Review Questions</i>	468
Laboratory Information Systems	i
Phlebotomy/Venipuncture Procedure	ix
<i>Index</i>	<i>I.I</i>

CONTENTS OF VOLUME 2

SECTION 4: MICROBIOLOGY AND VIROLOGY

19. Introduction to Diagnostic Microbiology	471
20. Identification of Pathogenic Bacteria	544
21. Laboratory Diagnosis of Mycotic Infections	644
22. Laboratory Diagnosis of Parasitic Infections	678

SECTION 5: SEROLOGY

23. Introduction to Immunology and Principles of Serodiagnosis	729
24. Laboratory Procedures in Serology	750

SECTION 6: CLINICAL PATHOLOGY

25. Urine Analysis	805
26. Laboratory Examination of Miscellaneous Body Fluids	845
27. Semen Analysis	872
28. Stool Examination	882
Molecular Pathology	i
Morphology and Life Cycles of Human Parasites	xi
<i>Index</i>	<i>I.I</i>

CONTENTS OF VOLUME 3**SECTION 7: CLINICAL BIOCHEMISTRY**

29. Biochemical Processes of the Body Under Normal and Pathogenic Conditions	901
30. Specimen Collection and Processing for Biochemical Analyses	920
31. Techniques of Analytical Chemistry	932
32. Automation in Clinical Biochemistry	961
33. Routine Biochemical Test Procedures	985
34. Biochemical Test Profiles	1081
35. Therapeutic Drug Monitoring and Clinical Toxicology	1102

SECTION 8: HISTOLOGY AND CYTOLOGY

36. Introduction to Histotechnology and Cytotechnology	1127
37. Laboratory Techniques in Histology	1147
38. Laboratory Techniques in Diagnostic Exfoliative Cytology	1206
39. Basics of Immunohistochemistry	1222
40. Polymerase Chain Reaction in Clinical Diagnosis	1240
<i>Medical Terminology</i>	1387
<i>Glossary and Technical Terms</i>	1391
<i>Appendices</i>	1421
<i>Index</i>	1441