

CONTENTS

Introduction	9
1. Laboratory safety rules	11
1.1 Purpose of the safety principles	11
1.2 Principles	11
GENERAL MICROBIOLOGY	
2. Specimen collection & diagnostic principles	13
2.1 Specimen collection & transport	13
2.2 Material & methods	13
2.3 Conditions for specimen collection & transport	14
2.4 Request form	14
2.5 Diagnostic principles in medical microbiology	15
2.6 Light microscopy	15
2.7 Gram staining – basic staining procedure in clinical microbiology	16
2.7.1 Smear preparation	16
2.7.2 Quality of cell wall & Gram staining procedure	16
2.8 Practical part – specimen collection & diagnostic principles	17
2.9 Lab quiz	18
3. Direct detection & typing of infectious agents	19
3.1 Definition of agent detection & typing	19
3.2 Application of microscopy technics	19
3.3 Application of nucleic acid based methods	21
3.3.1 Principle of DNA amplification by PCR methods	21
3.3.2 Principle of DNA hybridization methods	22
3.3.3 Principle of sequence based methods	22
3.4 Other methods in direct antigen detection	22
3.4.1 Immunochromatographic method	22
3.5 Practical part – direct detection & typing of infectious agents	23
3.6 Lab quiz	24
4. Cultivation of infectious agents	25
4.1 Cultivation – definition	25
4.2 Cultivation of bacterial, viral & parasitic agents	25
4.3 Media for bacterial cultivation	26
4.4 Examples of bacterial cultures	27
4.5 Conditions for cultivation	28
4.6 Special staining procedures	28

4.7	Practical part – special stainings & cultivation of infectious agents	28
4.8	Lab quiz	30
5.	Antibiotic susceptibility testing	31
5.1	Antimicrobials; mode of action & resistance	31
5.2	Antimicrobial susceptibility testing	31
5.3	Basic methods	32
5.4	Interpretations of the results	32
5.5	Other methods; procedures & interpretation	33
5.6	Practical part – special stainings & cultivation of infectious agents	34
5.7	Lab quiz	36
6.	Identification of infectious agents	37
6.1	Definition of identification of infectious agents	37
6.2	Phenotypical methods	37
6.3	Application of phenotypical methods	40
6.4	Genotypical methods & application	41
6.5	Practical part – identification of infectious agents	41
6.6	Lab quiz	43
7.	Detection of specific antibodies	45
7.1	Immune response	45
7.2	Antigens & antibodies	45
7.3	Basic serological methods	46
7.4	Serological methods & application	48
7.5	Practical part – detection of specific antibodies	49
7.6	Lab quiz	50
8.	General mycology	51
8.1	Fungi	51
8.2	Classification	51
8.3	Diagnostics	52
8.3.1	Microscopy	52
8.3.2	Cultivation	53
8.3.3	Identification	53
8.4	Susceptibility to antimycotical drugs	56
8.5	Serological methods	56
8.6	Direct detection of the agent in clinical material	57
8.7	Practical part – general mycology	57
8.8	Lab quiz	58
9.	General virology	59
9.1	Definition of viruses	59
9.2	History	60
9.3	Electronmicroscopic evidence	60
9.4	Virus detection by other methods	60
9.5	Practical part – general virology	63
9.6	Lab quiz	64
10.	General parasitology	65
10.1	Parasitism, parasite and host	65
10.2	Classification	65
10.3	Diagnostic methods	66
10.4	Material and diagnostics	67
10.5	Practical part – general parasitology	68
10.6	Lab quiz	69

11. Molecular microbiology & epidemiology	71
11.1 Definition	71
11.2 Bacterial cell wall synthesis and antibiotics	71
11.3 Antibiotic resistance genes	72
11.4 Regulation of structural genes for antibiotic resistance	72
11.5 Epidemiologic typing	73
11.6 Practical part – molecular microbiology & epidemiology	74
11.7 Lab quiz	75

SPECIAL MICROBIOLOGY

12. Staphylococci	77
12.1 General features	77
12.2 Virulence factors and pathogenesis	77
12.3 Infections	77
12.4 Treatment, prevention & control	78
12.5 Laboratory diagnosis	78
12.6 Practical part – staphylococci	80
12.7 Lab quiz	81
13. Streptococci & enterococci	83
13.1 General features	83
13.2 Classification	83
13.3 Virulence factors and pathogenesis	83
13.4 Infections and poststreptococcal diseases	84
13.5 Treatment, prevention & control	84
13.6 Laboratory diagnosis	85
13.7 Practical part – streptococci & enterococci	87
13.8 Lab quiz	88
14. Corynebacteria & listeria	89
14.1 General features	89
14.2 Virulence factors & pathogenesis	89
14.3 Infections & epidemiology	90
14.4 Treatment, prevention & control	90
14.5 Laboratory diagnosis	90
14.6 Practical part – corynebacteria & listeria	92
14.7 Lab quiz	94
15. Enterobacteria & enteric pathogens	95
15.1 General features	95
15.2 Virulence factors & pathogenesis	95
15.3 Infections & epidemiology	96
15.4 Treatment, prevention & control	96
15.5 Laboratory diagnosis	96
15.6 Practical part – enterobacteria and enteric pathogens	98
15.7 Lab quiz	100
16. Anaerobic bacteria	101
16.1 General features	101
16.2 Virulence factors & pathogenesis	101
16.3 Infections & epidemiology	102
16.4 Treatment, prevention & control	102
16.5 Laboratory diagnosis	102
16.6 Practical part – anaerobic bacteria	104
16.7 Lab quiz	106

17. <i>Neisseria, Bordetella & Haemophilus</i>	107
17.1 General features	107
17.2 Virulence factors & pathogenesis	107
17.3 Infections & epidemiology	107
17.4 Treatment, prevention & control	108
17.5 Laboratory diagnosis	108
17.6 Practical part – <i>Neisseria, Bordetella, Haemophilus</i>	110
17.7 Lab quiz	112
18. <i>Pseudomonas aeruginosa</i> & other non-fermenters	113
18.1 General features	113
18.2 Virulence factors & pathogenesis	113
18.3 Infections & epidemiology	114
18.4 Treatment, prevention & control	114
18.5 Laboratory diagnosis	114
18.6 Practical part – <i>pseudomonas</i> and non-fermenters	116
18.7 Lab quiz	118
19. <i>Mycobacteria</i>	119
19.1 General features	119
19.2 Classification of <i>mycobacteria</i>	119
19.3 Virulence factors & pathogenesis	119
19.4 Infections & epidemiology	120
19.5 Treatment, prevention & control	120
19.6 Laboratory diagnosis	121
19.7 Practical part – <i>mycobacteria</i>	122
19.8 Lab quiz	124
20. <i>Yeasts</i>	125
20.1 General features	125
20.2 Virulence factors & pathogenesis	125
20.3 Infections & epidemiology	126
20.4 Treatment, prevention & control	126
20.5 Laboratory diagnosis	126
20.6 Practical part – <i>yeasts</i>	128
20.7 Lab quiz	130
21. <i>Arthropods</i>	131
21.1 General properties	131
21.2 Classification	131
21.3 Pathogenesis	131
21.4 Infection caused or transmitted by <i>arthropods</i>	131
21.5 Treatment and prevention	132
21.6 Laboratory diagnosis	133
21.7 Practical part – <i>arthropods</i>	134
21.8 Lab quiz	135