

CONTENTS

Chapter 1. GENERAL PRINCIPLES	1
A. Introduction	1
B. Scale of manufacture	5
C. Safety	6
Chapter 2. SAMPLES AND SAMPLING	21
A. Introduction	21
B. Samplers	22
C. Sample preparation room	23
D. Sampling devices	23
E. Increments and gross sample	25
F. Sampling of containers and packages	26
G. Procedure	27
H. The laboratory sample	32
I. Standard sampling procedures	33
Chapter 3. LABORATORY OUTLINE AND EQUIPMENT	43
A. Laboratory outline	43
B. Equipment	46
Chapter 4. LABORATORY INSTRUMENTS AND ASSOCIATED TECHNIQUES	65
A. X-ray fluorescence spectrometry	66
B. X-ray diffraction analysis	68
C. Electron-probe analysis	69
D. Emission spectrography	71
E. Spark-(solid) source mass spectrometry	73
F. Atomic absorption spectrometry	74
G. Ultra-violet spectrophotometry	75
H. Infra-red spectrophotometry	77
I. Spectrofluorimetry analysis	80
J. Mass spectrometry	81
K. Nuclear magnetic resonance spectrometry	83
L. Mossbaure spectroscopy	85
M. Electron spin resonance spectroscopy	86
N. Polarography	86
O. Thermogravimetric analysis	89
P. Differential thermal analysis	89
Q. Microscopy	90

Chapter 5. LABORATORY METHODS	96
A. Accuracy	96
B. Organic analysis	97
C. Chromatography	99
D. Electrophoresis	108
E. Distillation	109
F. Refractometry	110
G. Inorganic analysis	111
H. Potentiometric titration	112
I. Amperometric titration	113
J. Coulometric titration	114
K. Conductometric titration	115
L. Miscellaneous titrimetric procedures	116
M. Electrodeposition	118
N. Colorimetry	119
O. Ion-exchange chromatography	120
Chapter 6. AUTOMATIC AND ON-LINE OR STREAM ANALYSIS	125
A. Automatic laboratory analysis	129
B. On-line or stream analysis	134
C. Checking and maintenance	144
D. Computers	144
Chapter 7. WORKS' ANCILLARY PROBLEMS	147
A. Micro-chemical analysis	147
B. Radio-chemical analysis	153
C. Surface area and pore size distribution	158
D. Micromeritics	160
E. Effluents	162
F. Fuel, water, steam and lubricants	166
G. Corrosion	169
H. Water content	169
I. Packages	171
J. Analysis for the medical department	171
K. Miscellaneous requirements	172

Chapter 8. LABORATORY ADMINISTRATION AND ANALYTICAL RESEARCH	177
A. Laboratory personnel	177
B. Work processing	179
C. Costs and overheads	182
D. Reagents and apparatus	183
E. Calculations	184
F. Sample storage	185
G. Standard analytical methods	186
H. Specifications and control charts	188
I. Library and information services	189
J. Patents	190
K. Work study	190
L. Analytical research	191
M. Inter-laboratory communication	195
Appendix I. SAMPLING SYSTEM FOR ANALYTICAL EQUIPMENT	197
Appendix II. ANALYTICAL INSTRUMENTS DESIGN CHECK LIST	204
GLOSSARY	211
INDEX	215