

**CONTENTS**

<b>CHAPTER 1 Concepts of Analytical Chemistry</b>	<b>1</b>
A. Qualitative Analysis	1
B. Quantitative Analysis	2
C. Reliability of Results	3
D. Sampling	17
<b>CHAPTER 2 Introduction to Spectroscopy</b>	<b>21</b>
A. The Interaction Between Energy and Matter	21
B. The Absorption of Energy by Atoms	24
C. The Absorption of Energy by Molecules	27
D. The Emission of Radiant Energy by Atoms and Molecules; Methods of Electronic Excitation of Atoms	32
E. Absorption Laws	35
F. Calibration Curves	41
<b>CHAPTER 3 Concepts of Spectroscopy</b>	<b>48</b>
A. Optical Systems Used in Spectroscopy	48
B. Analytical Methods Used in Spectroscopy	57
<b>CHAPTER 4 Nuclear Magnetic Resonance</b>	<b>61</b>
A. Properties of the Hydrogen Nucleus	62
B. Quantization	62
C. Width of Absorption Lines	65
D. Chemical Shifts	67
E. Spin-Spin Splitting	69
F. Equipment	74
G. Typical Spectra; Applications to Analytical Chemistry	76
<b>CHAPTER 5 Infrared Absorption</b>	<b>88</b>
A. Requirements for Infrared Absorption	88
B. Movements of Molecules	90
C. Equipment	95
D. Analytical Applications	103
E. Raman Spectroscopy	112

<b>CHAPTER 6 Ultraviolet Molecular Absorption Spectroscopy</b>	<b>119</b>
A. Introduction	119
B. Equipment	125
C. Analytical Applications	130
<b>CHAPTER 7 Atomic Absorption Spectroscopy</b>	<b>137</b>
A. Absorption of Radiant Energy by Atoms	137
B. Equipment	139
C. Analytical Applications	145
<b>CHAPTER 8 Colorimetry (Spectrophotometry) and Polarimetry</b>	<b>151</b>
A. Background of Colorimetry; Related Fields	151
B. The Absorption Laws of Colorimetry	153
C. Error and Relative Error in Colorimetry	159
D. Spectrophotometric Equipment	161
E. Analytical Applications	164
F. Polarimetry	165
<b>CHAPTER 9 Flame Photometry</b>	<b>173</b>
A. Origin of Spectra	173
B. Equipment	175
C. Flames	179
D. Analytical Applications	181
E. Conclusion	189
<b>CHAPTER 10 Emission Spectrography</b>	<b>193</b>
A. Origin of Spectra	193
B. Equipment	194
C. Analytical Applications	201
<b>CHAPTER 11 X-Ray Spectroscopy</b>	<b>211</b>
A. Origin of Spectra	213
B. Equipment	217
C. Analytical Applications of X Rays	222
<b>CHAPTER 12 Chromatography</b>	<b>237</b>
A. Principles of Chromatography	238
B. Efficiency of the Chromatographic Process	241
C. Equipment	246
D. Branches of Gas Chromatography	254
E. Analytical Applications of Gas Chromatography	259
F. Related Chromatographic Procedures	261

<b>CHAPTER 13 Thermal Analysis</b>	<b>277</b>
A. Equipment for and Applications of Thermogravimetric Analysis	277
B. Equipment for and Applications of Differential Thermal Analysis	283
C. Combination Techniques	286
<b>CHAPTER 14 Mass Spectrometry</b>	<b>289</b>
A. Description	289
B. Equipment	292
C. Interpretation of Mass Spectra	296
D. TIME-OF-FLIGHT MASS SPECTROMETRY	301
E. Analytical Uses of Mass Spectrometry	303
<b>CHAPTER 15 Electrochemistry</b>	<b>307</b>
A. The Electric Cell	308
B. The Nernst Equation	315
C. Electroanalytical Methods	320