

---

# Contents

<b>1</b>	<b>Introduction</b>	<b>1</b>
<b>2</b>	<b>Principles</b>	<b>3</b>
2.1	The Bouguer-Lambert-Beer Law and Its Practical Application	3
2.2	Primary Photophysical Processes	5
2.3	Vibrational Structure of Electronic Spectra	6
2.4	Electronic Spectra and Molecular Structure	8
	References	9
<b>3</b>	<b>Photometers and Spectrophotometers</b>	<b>10</b>
3.1	Photometers	11
3.2	Spectrophotometers	12
3.3	The Stray Light Error	17
3.3.1	General Observations	17
3.3.2	The Stray Light Error of Transmission and Absorbance and Its Measurement	19
3.4	Light Sources for UV-VIS Spectroscopy	21
	References	24
<b>4</b>	<b>Analytical Applications of UV-VIS Spectroscopy</b>	<b>26</b>
4.1	Photometric Determination of a Single Substance	26
4.1.1	Photometric Determination of Elements by Means of Complexing Agents	29
4.1.2	Photometric Determination of Anions and Ammonia	38
4.1.3	Photometric Water Analyses	43
4.1.4	Photometric Determination of Organic Compounds	44
4.1.5	Enzymatic Analysis and Enzyme Kinetics	49
4.2	Multicomponent Analysis	58
4.2.1	Basic Equations	58
4.2.2	An Example of a Multicomponent Analysis	65
4.3	Identification and Structure Determination	68

<b>4.4</b>	<b>Chemometrics</b>	75
	<b>References</b>	76
 <b>5</b>	<b>Recent Developments in UV-VIS Spectroscopy</b>	81
<b>5.1</b>	Dual-Wavelength Spectroscopy	81
<b>5.2</b>	Derivative Spectroscopy	88
<b>5.3</b>	Reflectance Spectroscopy	95
<b>5.4</b>	Photoacoustic Spectroscopy	101
<b>5.4.1</b>	Principles of PAS	101
<b>5.4.2</b>	PAS Applications	110
<b>5.5</b>	Luminescence-Excitation Spectroscopy	120
	<b>References</b>	128
 <b>6</b>	<b>Investigation of Equilibria</b>	131
<b>6.1</b>	General	131
<b>6.2</b>	Protonic Equilibria; pK-Values	132
<b>6.3</b>	Complex-Forming Equilibria	142
<b>6.3.1</b>	H-Bond Association	143
<b>6.3.2</b>	EDA Complexes	149
<b>6.3.3</b>	Metal Complexes	158
	<b>References</b>	162
 <b>7</b>	<b>Investigation of the Kinetics of Chemical Reactions</b>	165
<b>7.1</b>	Fundamental Equations of Kinetics	165
<b>7.1.1</b>	Introduction of Absorbance as a Measurement Parameter	165
<b>7.1.2</b>	Classification of Other Types of Reaction	167
<b>7.1.2.1</b>	2nd Order Reactions	167
<b>7.1.2.2</b>	3rd Order Reactions	169
<b>7.1.2.3</b>	Pseudo 1st Order Reactions	171
<b>7.1.2.4</b>	Consecutive Reactions	172
<b>7.1.2.5</b>	Parallel Reactions	173
<b>7.2</b>	The Number of Linearly Independent Partial Reactions	175
<b>7.3</b>	Evaluation of Kinetic Measurements	179
<b>7.4</b>	Examples	183
<b>7.5</b>	Fast Reactions	190
<b>7.5.1</b>	Flow Methods: The Stopped-Flow Technique	190
<b>7.5.2</b>	Spectroscopic Relaxation Techniques	193

7.6	Photoreactions .....	197
7.7	Spectrometers for Kinetic Measurements .....	203
7.7.1	Rapid Spectrometers .....	204
7.7.2	FT-UV Spectrometers .....	204
7.7.3	Diode Array Spectrometers .....	205
7.8	Determination of the Spectra of Intermediates ...	207
	References .....	210
<b>8</b>	<b>Evaluation of UV-VIS Spectral Bands .....</b>	<b>215</b>
8.1	Oscillator Strength and Transition Moment .....	215
8.2	Band Analysis .....	220
8.2.1	Gaussian and Lorentzian Functions .....	220
8.2.2	Application of Derivative Spectra .....	223
8.3	Vibrational Structure .....	228
	References .....	233
	<b>Index of Illustrated Absorption Spectra .....</b>	<b>235</b>
	<b>Subject Index .....</b>	<b>237</b>