

CONTENTS

CONTRIBUTORS	ix
FOREWORD	xi
PREFACE	xiii
CONTENTS OF VOLUME 13, PART B	xv
CONTRIBUTORS TO VOLUME 13, PART B	xvii

1. Introduction

by DUDLEY WILLIAMS

1.1. History of Spectroscopy	3
1.1.1. Newton's Contributions	3
1.1.2. Nineteenth-Century Developments	5
1.1.3. Twentieth-Century Developments	7
1.1.4. The Infrared Region	8
1.1.5. The Submillimeter and Microwave Regions	10
1.1.6. The Radio Frequency Region	12
1.1.7. The Ultraviolet Region	13
1.1.8. The X-Ray Region	14
1.1.9. The Gamma-Ray Region	16
1.1.10. The Role of Spectroscopy in Twentieth-Century Physics	17
1.2. General Methods of Spectroscopy	19
1.2.1. Emission Spectra	20
1.2.2. Absorption Spectra	22
1.2.3. Sources	24
1.2.4. Resolving Instruments	24
1.2.5. Detectors	26
1.2.6. Data Handling Techniques	28

2. Theory of Radiation and Radiative Transitions	
by BASIL CURNUTTE, JOHN SPANGLER, AND	
LARRY WEAVER	
2.1. Introduction	31
2.2. Light	
2.2.1. Classical Picture	32
2.2.2. Quantum Picture	64
2.3. Interaction of Light and Matter	79
2.3.1. Time-Dependent Perturbation Theory	79
2.3.2. The Multipole Expansion	93
2.3.3. Selection Rules	97
2.4. Applications	100
2.4.1. Atomic and Nuclear Decay Rates	100
2.4.2. Molecular Transitions	106
2.5. Conclusion	113
3. Nuclear and Atomic Spectroscopy	
3.1. Gamma-Ray Region	115
by JAMES C. LEGG AND GREGORY G. SEAMAN	
3.1.1. Energy and Intensity	115
3.1.2. Gamma-Ray Detectors	121
3.1.3. Angular Correlations	134
3.1.4. Transition Rate and Lifetime Measurements	141
3.2. X-Ray Region	148
by ROBERT L. KAUFFMAN AND PATRICK RICHARD	
3.2.1. Introduction	148
3.2.2. Detectors and Spectrometers	149
3.2.3. X-Ray Spectra	166
3.2.4. Selected Topics	191

3.3. Far Ultraviolet Region	204
by JAMES A. R. SAMSON	
3.3.1. Introduction	204
3.3.2. Photon Sources	205
3.3.3. Dispersive Devices	226
3.3.4. Optical Windows and Filters	238
3.3.5. Polarizers	239
3.3.6. Detectors	241
3.3.7. Wavelength Standards	246
3.3.8. Experimental Applications	247
3.4. Optical Region	253
by P. F. A. KLINKENBERG	
3.4.1. Introduction	253
3.4.2. Light Sources	259
3.4.3. Spectroscopic Instruments	274
3.4.4. Detection of Optical Radiation	314
3.4.5. Evaluation of Spectra	325
3.4.6. Analysis of Atomic Spectra	336
AUTHOR INDEX	347
SUBJECT INDEX FOR PART A	359
SUBJECT INDEX FOR PART B	363