

INTRODUCTION .....	XXI
STUDY OBJECTIVES .....	XXI
REASONS FOR DOING THIS STUDY .....	XXI
CONTRIBUTIONS TO THE STUDY .....	XXII
SCOPE OF THE STUDY .....	XXII
METHODOLOGY .....	XXII
INFORMATION SOURCES .....	XXII
AUTHOR'S CREDENTIALS .....	XXIII
RELATED BCC REPORTS .....	XXIII
BCC ON-LINE SERVICES .....	XXIII
INTERNET .....	XXIII
SUMMARY .....	XXIV
SUMMARY TABLE SALES IN SPECTROSCOPY INDUSTRY IN THE U.S., THROUGH 2007 (\$ MILLIONS) .....	XXIV
SUMMARY FIGURE SALES IN SPECTROSCOPY INDUSTRY IN THE U.S., 2000- 2007 (\$ MILLIONS) .....	XXV
OVERVIEW .....	1
HISTORY OF SPECTROSCOPY .....	1
TABLE 1 HISTORIC EVENTS IN SPECTROSCOPY .....	1
TABLE 1 (CONTINUED) .....	2
TABLE 1 (CONTINUED) .....	3
DEFINITION OF SPECTROSCOPY .....	3
ABSORPTION .....	4
EMISSION .....	4
SCATTERING .....	4
SPECTROSCOPY .....	4
TABLE 2 FEATURES OF SPECTROSCOPE, SPECTROMETERS, SPECTROPHOTOMETERS AND SPECTROGRAPHS .....	5
TYPES OF SPECTROSCOPY .....	6
TABLE 3 TYPES OF SPECTROSCOPY .....	6
ELECTROMAGNETIC SPECTRUM .....	6
TABLE 4 ELECTROMAGNETIC SPECTRUM .....	7
INFRARED SPECTROSCOPY (IR) .....	7
INSTRUMENTATION .....	8
Sample Cells and Sampling of Substances .....	8
FTIR (FOURIER TRANSFORM INFRARED SPECTROSCOPY) .....	9
MICROWAVE SPECTROSCOPY .....	9
INSTRUMENTATION .....	10
RAMAN SPECTROSCOPY .....	10
INSTRUMENTATION .....	10
ULTRAVIOLET AND VISIBLE SPECTROSCOPY (UV/VIS) .....	11
INSTRUMENTATION .....	11
NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY (NMR) .....	11

INSTRUMENTATION .....	12
ELECTRON SPIN RESONANCE SPECTROSCOPY (ESR) .....	12
INSTRUMENTATION .....	12
MASS SPECTROSCOPY .....	13
INSTRUMENTATION .....	13
X-RAY SPECTROSCOPY .....	14
X-RAY ABSORPTION .....	14
X-RAY FLUORESCENCE .....	14
X-RAY DIFFRACTION .....	14
INSTRUMENTATION .....	15
ATOMIC ABSORPTION SPECTROSCOPY .....	15
INSTRUMENTATION .....	15
ARC/SPARK SPECTROSCOPY .....	16
INSTRUMENTATION .....	16
PLASMA SPECTROSCOPY .....	16
INSTRUMENTATION .....	17
FLUORESCENCE SPECTROSCOPY .....	17
INSTRUMENTATION .....	18
HYPHENATED SPECTROSCOPY (GC-MS AND LC-MS) .....	18
GAS CHROMATOGRAPHY-MASS SPECTROSCOPY (GC-MS) .....	18
LIQUID CHROMATOGRAPHY-MASS SPECTROSCOPY (LC-MS) .....	19
FLAME PHOTOMETRY OR FLAME EMISSION SPECTROSCOPY .....	19
MÖSSBAUER SPECTROSCOPY .....	19
<i>TABLE 5 PROPERTIES USED FOR ANALYSIS .....</i>	<i>20</i>
GOVERNMENT REGULATIONS .....	21
MASS SPECTROSCOPY .....	21
INNOVATIONS IN GASOLINE ANALYSIS BY FTIR SPECTROSCOPY .....	21
GAMMA AND ALPHA SPECTROSCOPY .....	22
ELECTRON SPIN RESONANCE SPECTROSCOPY .....	22
EPA-APPROVED ANALYTICAL METHODS FOR THE ANALYSIS OF ARSENIC IN DRINKING WATER .....	23
<i>TABLE 6 THE PROPOSED APPROVED AND ELIMINATED ANALYTICAL METHODS FOR SPECTROSCOPY BY EPA FOR DETERMINING MCL IN DRINKING WATER .....</i>	<i>23</i>
MAGNETIC RESONANCE IMAGING (MRI) AND MAGNETIC RESONANCE SPECTROSCOPY (MRS) .....	24
Magnetic Resonance Spectroscopy for Detecting Cancer .....	24
Induced X-ray Emission Spectroscopy and Atomic Absorption Spectroscopy (AA) .....	24
<i>TABLE 7 AGENCIES CONCERNED WITH REGULATIONS FOR SPECTROSCOPY .....</i>	<i>25</i>
INDUSTRY STRUCTURE .....	26
INDUSTRIAL CLASSIFICATION .....	26

<i>TABLE 8 INDUSTRIAL CLASSIFICATION CODES</i> .....	26
NATIONAL PRIORITIES DRIVING THE SPECTROSCOPY MARKET.....	26
<i>TABLE 9 NATIONAL PRIORITIES DRIVING THE SPECTROSCOPY MARKET</i> .....	27
MERGERS, ACQUISITIONS AND LATEST HAPPENINGS IN THE SPECTROSCOPIC MARKET .....	27
MERGERS, ACQUISITIONS AND LATEST...(CONTINUED) .....	28
FACTORS GOVERNING DEMAND AND USE.....	29
PRICES.....	29
<i>TABLE 10 LIST OF PRICES OF VARIOUS INSTRUMENTS USED IN SPECTROSCOPY</i> .....	29
<i>TABLE 10 (CONTINUED)</i> .....	30
INDUSTRIAL PRODUCTIVITY .....	30
Cost Issues .....	30
Low Power and Bench Top Instruments .....	31
Software Used and Ease of Operation .....	31
Detector.....	32
Taxes and Ownership Costs.....	32
MARKET LEADERS AND MARKET SHARE.....	32
MARKET LEADERS AND MARKET SHARES .....	32
<i>TABLE 11 MAJOR MANUFACTURERS IN IR SPECTROSCOPY</i> .....	32
<i>TABLE 12 ESTIMATED MARKET SHARES OF IR SPECTROSCOPY MANUFACTURERS, 2002</i> .....	33
<i>FIGURE 1 ESTIMATED MARKET SHARES OF IR SPECTROSCOPY MANUFACTURERS, 2002 (%)</i> .....	33
MARKET LEADERS AND MARKET SHARES FOR RAMAN INSTRUMENTS .....	34
<i>TABLE 13 MAJOR RAMAN SPECTROSCOPY MANUFACTURERS</i> .....	34
<i>TABLE 14 ESTIMATED MARKET SHARES OF RAMAN SPECTROSCOPY MANUFACTURERS, 2002</i> .....	34
<i>FIGURE 2 ESTIMATED MARKET SHARES OF RAMAN SPECTROSCOPY MANUFACTURERS, 2002</i> .....	35
MARKET LEADERS AND MARKET SHARES FOR UV- VISIBLE INSTRUMENTS .....	35
<i>TABLE 15 MAJOR UV-VISIBLE SPECTROSCOPY MANUFACTURERS</i> .....	35
<i>TABLE 16 ESTIMATED MARKET SHARES OF UV-VISIBLE SPECTROSCOPY MANUFACTURERS, 2002</i> .....	36
<i>FIGURE 3 ESTIMATED MARKET SHARES OF UV-VISIBLE SPECTROSCOPY MANUFACTURERS, 2002 (%)</i> .....	36
MARKET LEADERS AND MARKET SHARES FOR NMR AND ESR INSTRUMENTS .....	37
<i>TABLE 17 MAJOR NMR AND ESR SPECTROSCOPY MANUFACTURERS</i> .....	37
<i>TABLE 18 ESTIMATED MARKET SHARES OF NMR SPECTROSCOPY MANUFACTURERS, 2002</i> .....	37
<i>FIGURE 4 ESTIMATED MARKET SHARES OF NMR AND ESR SPECTROSCOPY MANUFACTURERS, 2002 (%)</i> .....	38
MARKET LEADERS AND MARKET SHARES FOR MASS SPECTROSCOPY INSTRUMENTS .....	38
<i>TABLE 19 MAJOR MASS SPECTROSCOPY MANUFACTURERS</i> .....	38

TABLE 20 ESTIMATED MARKET SHARES OF MASS SPECTROSCOPY MANUFACTURERS, 2002 (%).....	39
FIGURE 5 ESTIMATED MARKET SHARES OF MASS SPECTROSCOPY MANUFACTURERS, 2002 (%).....	39
<b>MARKET LEADERS AND MARKET SHARES FOR X-RAY     INSTRUMENTS .....</b>	<b>40</b>
TABLE 21 MAJOR X-RAY SPECTROSCOPY MANUFACTURERS.....	40
TABLE 22 ESTIMATED MARKET SHARES OF X-RAY SPECTROSCOPY MANUFACTURERS, 2002.....	40
FIGURE 6 ESTIMATED MARKET SHARES OF X-RAY SPECTROSCOPY MANUFACTURERS, 2002 (%).....	41
<b>MARKET LEADERS AND MARKET SHARES FOR ATOMIC     ABSORPTION INSTRUMENTS.....</b>	<b>41</b>
TABLE 23 MAJOR ATOMIC ABSORPTION SPECTROSCOPY MANUFACTURERS .....	41
TABLE 24 ESTIMATED MARKET SHARES OF ATOMIC ABSORPTION SPECTROSCOPY MANUFACTURERS, 2002.....	42
FIGURE 7 ESTIMATED MARKET SHARES OF ATOMIC ABSORPTION SPECTROSCOPY MANUFACTURERS, 2002 (%).....	42
<b>MARKET LEADERS AND MARKET SHARES FOR     ARC/SPARK INSTRUMENTS .....</b>	<b>42</b>
TABLE 25 MAJOR ARC/SPARK SPECTROSCOPY MANUFACTURERS .....	43
TABLE 26 ESTIMATED MARKET SHARES OF ARC/SPARK SPECTROSCOPY MANUFACTURERS, 2002.....	43
FIGURE 8 ESTIMATED MARKET SHARES OF ARC/SPARK SPECTROSCOPY MANUFACTURERS, 2002 (%).....	44
<b>MARKET LEADERS AND MARKET SHARES FOR PLASMA     INSTRUMENTS .....</b>	<b>44</b>
TABLE 27 MAJOR PLASMA SPECTROSCOPY MANUFACTURERS .....	44
TABLE 28 ESTIMATED MARKET SHARES OF PLASMA SPECTROSCOPY MANUFACTURERS, 2002 (%).....	45
FIGURE 9 ESTIMATED MARKET SHARES OF PLASMA SPECTROSCOPY MANUFACTURERS, 2002 (%).....	45
<b>MARKET LEADERS AND MARKET SHARES FOR     FLUORESCENCE INSTRUMENTS .....</b>	<b>45</b>
TABLE 29 MAJOR FLUORESCENCE SPECTROSCOPY MANUFACTURERS .....	46
TABLE 30 ESTIMATED MARKET SHARES OF FLUORESCENCE SPECTROSCOPY MANUFACTURERS, 2002 (%).....	46
FIGURE 10 ESTIMATED MARKET SHARES OF FLUORESCENCE SPECTROSCOPY MANUFACTURERS, 2002 (%).....	47
<b>MARKET LEADERS AND MARKET SHARES FOR     HYPHENATED INSTRUMENTS.....</b>	<b>47</b>
TABLE 31 MAJOR HYPHENATED SPECTROSCOPY MANUFACTURERS .....	47
TABLE 32 ESTIMATED MARKET SHARES OF HYPHENATED SPECTROSCOPY MANUFACTURERS, 2002 (%).....	48
FIGURE 11 ESTIMATED MARKET SHARES OF HYPHENATED SPECTROSCOPY MANUFACTURERS, 2002 (%).....	48
<b>TYPES OF ANALYSIS.....</b>	<b>49</b>
<b>BULK ANALYSIS.....</b>	<b>49</b>
TABLE 33 BULK ANALYSIS.....	49

BULK ANALYSIS (CONTINUED) .....	50
TABLE 34 SPENDING FOR BULK ANALYSIS SPECTROSCOPY IN THE U.S., THROUGH 2007 (\$ MILLIONS) .....	51
FIGURE 12 SPENDING FOR BULK ANALYSIS SPECTROSCOPY IN THE U.S., 2000-2007 (\$ MILLIONS).....	53
MIXTURE ANALYSIS.....	53
TABLE 35 MIXTURE ANALYSIS .....	53
TABLE 36 SPENDING FOR MIXTURE ANALYSIS SPECTROSCOPY IN THE U.S., THROUGH 2007 (\$ MILLIONS) .....	55
FIGURE 13 SPENDING FOR MIXTURE ANALYSIS SPECTROSCOPY IN THE U.S., 2000-2007 (\$ MILLIONS).....	55
SURFACE ANALYSIS.....	56
TABLE 37 SURFACE ANALYSIS .....	57
TABLE 38 PRODUCTION OF SURFACE ANALYSIS INSTRUMENTS WORLDWIDE (%).....	58
TABLE 39 SPENDING FOR SURFACE ANALYSIS SPECTROSCOPY IN THE U.S., THROUGH 2007 (\$ MILLIONS) .....	59
FIGURE 14 SPENDING FOR SURFACE ANALYSIS SPECTROSCOPY IN THE U.S., 2000-2007 (\$ MILLIONS).....	59
MICROANALYSIS.....	60
TABLE 40 MICROANALYSIS.....	61
TABLE 41 SPENDING FOR MICROANALYSIS SPECTROSCOPY IN THE U.S. (\$ MILLIONS) .....	61
FIGURE 15 SPENDING FOR MICROANALYSIS SPECTROSCOPY IN THE U.S. (\$ MILLIONS).....	62
MARKETS BY TECHNOLOGY .....	61
INFRARED SPECTROSCOPY (IR) .....	61
TABLE 42 SALES IN IR SPECTROSCOPY IN THE U.S., THROUGH 2007 (\$ MILLIONS) .....	62
FIGURE 16 SALES IN IR SPECTROSCOPY IN THE U.S., 2000-2007 (\$ MILLIONS) .....	62
TABLE 43 IR SPECTROMETERS BY COMPANY .....	63
TABLE 43 (CONTINUED).....	64
RAMAN SPECTROSCOPY .....	64
TABLE 44 SALES IN RAMAN SPECTROSCOPY IN THE U.S., THROUGH 2007 (\$ MILLIONS) .....	65
FIGURE 17 SALES IN RAMAN SPECTROSCOPY IN THE U.S., 2000-2007 (\$ MILLIONS).....	65
TABLE 45 RAMAN SPECTROMETERS, BY COMPANY.....	66
UV-VIS SPECTROSCOPY .....	66
TABLE 46 SALES IN UV-VIS SPECTROSCOPY IN THE U.S., THROUGH 2007 (\$ MILLIONS) .....	67
FIGURE 18 SALES IN UV-VIS SPECTROSCOPY IN THE U.S., 2000-2007 (\$ MILLIONS).....	67
TABLE 47 UV-VIS SPECTROMETERS BY COMPANY.....	68
NMR AND ESR SPECTROSCOPY .....	68
TABLE 48 SALES IN NMR AND ESR SPECTROSCOPY IN THE U.S., THROUGH 2007 (\$ MILLIONS) .....	69
FIGURE 19 SALES IN NMR AND ESR SPECTROSCOPY IN THE U.S., 2000-2007 (\$ MILLIONS).....	70
TABLE 49 MAJOR PRODUCTS OF NMR AND ESR SPECTROSCOPY, BY COMPANY.....	70

TABLE 49 (CONTINUED).....	71
MASS SPECTROSCOPY .....	71
MASS SPECTROMETER PRODUCTS.....	71
Magnetic Sector .....	71
Time of Flight MS.....	72
Secondary Ion Mass Spectrometers .....	72
TABLE 50 SALES IN MASS SPECTROSCOPY IN THE U.S., THROUGH 2007 (\$	
MILLIONS) .....	72
FIGURE 20 SALES IN MASS SPECTROSCOPY IN THE U.S., 2000-2007 (\$	
MILLIONS).....	73
TABLE 51 MAJOR PRODUCTS OF MASS SPECTROSCOPY, BY COMPANY.....	74
X-RAY SPECTROSCOPY .....	75
TABLE 52 SALES IN X-RAY SPECTROSCOPY IN THE U.S., THROUGH 2007 (\$	
MILLIONS) .....	75
FIGURE 21 SALES IN X-RAY SPECTROSCOPY IN THE U.S., 2000-2007 (\$	
MILLIONS).....	76
TABLE 53 MAJOR PRODUCTS OF X-RAY SPECTROSCOPY BY COMPANY.....	77
ATOMIC ABSORPTION SPECTROSCOPY.....	78
TABLE 54 SALES IN ATOMIC ABSORPTION SPECTROSCOPY IN THE U.S.,	
THROUGH 2007 (\$ MILLIONS) .....	78
FIGURE 22 SALES IN ATOMIC ABSORPTION SPECTROSCOPY IN THE U.S.,	
2000-2007 (\$ MILLIONS).....	79
TABLE 55 MAJOR PRODUCTS OF ATOMIC ABSORPTION SPECTROSCOPY, BY	
COMPANY.....	79
TABLE 55 (CONTINUED).....	80
ARC/SPARK SPECTROSCOPY .....	80
TABLE 56 SALES IN ARC/SPARK SPECTROSCOPY IN THE U.S., THROUGH 2007	
(\$ MILLIONS).....	81
FIGURE 23 SALES IN ARC/SPARK SPECTROSCOPY IN THE U.S., 2000-2007 (\$	
MILLIONS).....	81
TABLE 57 MAJOR PRODUCTS OF ARC/SPARK SPECTROSCOPY, BY COMPANY.....	82
PLASMA SPECTROSCOPY .....	83
TABLE 58 SALES IN PLASMA SPECTROSCOPY IN THE U.S., THROUGH 2007 (\$	
MILLIONS) .....	83
FIGURE 24 SALES IN PLASMA SPECTROSCOPY IN THE U.S., 2000-2007 (\$	
MILLIONS).....	84
TABLE 59 MAJOR PRODUCTS OF PLASMA SPECTROSCOPY, BY COMPANY.....	84
TABLE 59 (CONTINUED).....	85
FLUORESCENCE SPECTROSCOPY .....	85
TABLE 60 SALES IN FLUORESCENCE SPECTROSCOPY IN THE U.S., THROUGH	
2007 (\$ MILLIONS) .....	85
FIGURE 25 SALES IN FLUORESCENCE SPECTROSCOPY IN THE U.S., 2000-2007	
(\$ MILLIONS).....	86
TABLE 61 MAJOR PRODUCTS OF FLUORESCENCE SPECTROSCOPY, BY	
COMPANY.....	87
HYPHENATED SPECTROSCOPY (INCLUDES GC-MS AND LC-MS) .....	87
HYPHENATED SPECTROSCOPY (CONTINUED) .....	88
TABLE 62 SALES IN HYPHENATED SPECTROSCOPY IN THE U.S., THROUGH	
2007 (\$ MILLIONS) .....	89
FIGURE 26 SALES IN HYPHENATED SPECTROSCOPY IN THE U.S., 2000-2007 (\$	
MILLIONS).....	89

TABLE 63 MAJOR PRODUCTS OF HYPHENATED SPECTROSCOPY, BY COMPANY.....	90
TABLE 63 (CONTINUED).....	91
APPLICATIONS.....	92
IR SPECTROSCOPY MARKET .....	92
TABLE 64 ESTIMATED MARKET SHARE OF IR SPECTROSCOPY CONSUMERS, 2002.....	92
FIGURE 27 ESTIMATED MARKET SHARE OF IR SPECTROSCOPY CONSUMERS, 2002 (%).....	93
RAMAN SPECTROSCOPY MARKET .....	93
TABLE 65 ESTIMATED MARKET SHARE OF RAMAN SPECTROSCOPY CONSUMERS, 2002.....	93
FIGURE 28 ESTIMATED MARKET SHARES OF RAMAN SPECTROSCOPY CONSUMERS, 2002 (%).....	94
UV-VISIBLE SPECTROSCOPY MARKET .....	94
TABLE 66 ESTIMATED MARKET SHARES OF UV-VISIBLE SPECTROSCOPY CONSUMERS, 2002.....	94
FIGURE 29 ESTIMATED MARKET SHARES OF UV-VISIBLE SPECTROSCOPY CONSUMERS, 2002 (%).....	95
NMR AND ESR SPECTROSCOPY MARKET.....	95
TABLE 67 ESTIMATED MARKET SHARES OF NMR AND ESR SPECTROSCOPY CONSUMERS, 2002 (%).....	95
FIGURE 30 ESTIMATED MARKET SHARES OF NMR AND ESR SPECTROSCOPY CONSUMERS, 2002 (%).....	96
MASS SPECTROSCOPY MARKET.....	96
TABLE 68 ESTIMATED MARKET SHARES OF MASS SPECTROSCOPY CONSUMERS, 2002.....	96
FIGURE 31 ESTIMATED MARKET SHARES OF MASS SPECTROSCOPY CONSUMERS, 2002 (%).....	97
X-RAY SPECTROSCOPY MARKET.....	97
TABLE 69 ESTIMATED MARKET SHARES OF X-RAY SPECTROSCOPY CONSUMERS, 2002.....	97
FIGURE 32 ESTIMATED MARKET SHARES OF X-RAY SPECTROSCOPY CONSUMERS, 2002 (%).....	98
ATOMIC ABSORPTION SPECTROSCOPY MARKET .....	98
TABLE 70 ESTIMATED MARKET SHARES OF ATOMIC ABSORPTION SPECTROSCOPY CONSUMERS, 2002.....	98
FIGURE 33 ESTIMATED MARKET SHARES OF ATOMIC ABSORPTION SPECTROSCOPY CONSUMERS, 2002 (%).....	99
ARC/SPARK SPECTROSCOPY MARKET.....	99
TABLE 71 ESTIMATED MARKET SHARES OF ARC/SPARK SPECTROSCOPY CONSUMERS, 2002.....	99
FIGURE 34 ESTIMATED MARKET SHARES OF ARC/SPARK SPECTROSCOPY CONSUMERS, 2002 (%).....	100
PLASMA SPECTROSCOPY MARKET.....	100
TABLE 72 ESTIMATED MARKET SHARES OF PLASMA SPECTROSCOPY CONSUMERS, 2002 (%).....	100
FIGURE 35 ESTIMATED MARKET SHARES OF PLASMA SPECTROSCOPY CONSUMERS, 2002 (%).....	101
FLUORESCENCE SPECTROSCOPY MARKET.....	101

TABLE 73 ESTIMATED MARKET SHARES OF FLUORESCENCE SPECTROSCOPY CONSUMERS IN 2002 (%).....	101
FIGURE 36 ESTIMATED MARKET SHARES OF FLUORESCENCE SPECTROSCOPY CONSUMERS, 2002 (%).....	102
HYPHENATED SPECTROSCOPY MARKET .....	102
TABLE 74 ESTIMATED MARKET SHARES OF HYPHENATED SPECTROSCOPY CONSUMER, 2002.....	102
FIGURE 37 ESTIMATED MARKET SHARES OF HYPHENATED SPECTROSCOPY CONSUMERS, 2002 (%).....	103
PHARMACEUTICAL AND BIOTECHNOLOGY INDUSTRY .....	103
TABLE 75 EXPENDITURES FOR SPECTROSCOPY IN THE PHARMACEUTICAL AND BIOTECHNOLOGY INDUSTRIES IN THE U.S., THROUGH 2007 (\$ MILLIONS) .....	104
FIGURE 38 EXPENDITURES FOR SPECTROSCOPY IN THE PHARMACEUTICAL AND BIOTECHNOLOGY INDUSTRIES IN THE U.S., 2002-2007 (\$ MILLIONS).....	105
ENVIRONMENTAL SCIENCE INDUSTRY.....	105
TABLE 76 EXPENDITURES FOR SPECTROSCOPY IN THE ENVIRONMENTAL SCIENCES INDUSTRY IN THE U.S., THROUGH 2007 (\$ MILLIONS) .....	106
FIGURE 39 EXPENDITURES FOR SPECTROSCOPY IN THE ENVIRONMENTAL SCIENCE INDUSTRY IN THE U.S., 2000-2007 (\$ MILLIONS).....	106
FOOD AND BEVERAGE INDUSTRY .....	107
TABLE 77 EXPENDITURES FOR SPECTROSCOPY IN THE FOOD AND BEVERAGE INDUSTRY IN THE U.S., THROUGH 2007 (\$ MILLIONS).....	108
FIGURE 40 EXPENDITURES FOR SPECTROSCOPY IN THE FOOD AND BEVERAGE INDUSTRY IN THE U.S., 2000-2007 (\$ MILLIONS).....	109
MATERIAL SCIENCE INDUSTRY.....	109
TABLE 78 EXPENDITURES FOR SPECTROSCOPY IN THE MATERIAL SCIENCE INDUSTRY IN THE U.S., THROUGH 2007 (\$ MILLIONS).....	110
FIGURE 41 EXPENDITURES FOR SPECTROSCOPY IN THE MATERIAL SCIENCE INDUSTRY IN THE U.S., 2000-2007 (\$ MILLIONS) .....	111
TABLE 79 INDUSTRY EXPENDITURES FOR SPECTROSCOPY, THROUGH 2007 (\$ MILLIONS) .....	111
FIGURE 42 INDUSTRY EXPENDITURES FOR SPECTROSCOPY, 2000-2007 (\$ MILLIONS).....	112
PATENTS.....	113
PATENTS BY TECHNOLOGY .....	113
TABLE 80 NUMBER OF SPECTROSCOPY PATENTS IN EACH YEAR, 1997-2002.....	113
TABLE 80 (CONTINUED).....	114
FIGURE 43 NUMBER OF SPECTROSCOPY PATENTS IN EACH YEAR, 1997-2002 .....	115
TABLE 81 SIGNIFICANT PATENTS IN IR SPECTROSCOPY, 1997-2001.....	115
TABLE 81 (CONTINUED).....	116
TABLE 82 PATENTS IN IR SPECTROSCOPY, 2002 .....	117
TABLE 82 (CONTINUED).....	118
TABLE 83 SIGNIFICANT PATENTS IN RAMAN SPECTROSCOPY, 1997-2001.....	119
TABLE 84 PATENTS IN RAMAN SPECTROSCOPY, 2002 .....	120
TABLE 84 (CONTINUED).....	121
TABLE 84 (CONTINUED).....	122
TABLE 84 (CONTINUED).....	123
TABLE 85 SIGNIFICANT PATENTS IN NMR SPECTROSCOPY, 1997-2001.....	124
TABLE 86 PATENTS IN NMR SPECTROSCOPY, 2002.....	125
TABLE 86 (CONTINUED).....	126



TABLE 86 (CONTINUED).....	127
TABLE 86 (CONTINUED).....	128
TABLE 86 (CONTINUED).....	129
TABLE 87 SIGNIFICANT PATENTS IN ELECTRON SPIN RESONANCE SPECTROSCOPY, 1997-2001.....	130
TABLE 88 PATENTS IN ELECTRON SPIN RESONANCE SPECTROSCOPY, 2002.....	130
TABLE 89 SIGNIFICANT PATENTS IN OPTICAL EMISSION SPECTROSCOPY (INCLUDES ARC/SPARK AND PLASMA), 1997-2001.....	131
TABLE 90 PATENTS IN OPTICAL EMISSION SPECTROSCOPY (INCLUDES ARC/SPARK AND PLASMA), 2002.....	131
TABLE 90 (CONTINUED).....	132
TABLE 91 PATENTS IN UV-VISIBLE SPECTROSCOPY, 2002.....	132
TABLE 91 (CONTINUED).....	133
TABLE 92 SIGNIFICANT PATENTS IN MASS SPECTROSCOPY, 1997-2001.....	133
TABLE 93 PATENTS IN MASS SPECTROSCOPY, 2002.....	134
TABLE 93 (CONTINUED).....	135
TABLE 94 SIGNIFICANT PATENTS IN LC-GC AND LC-MS SPECTROSCOPY, 1997-2001.....	135
TABLE 95 PATENTS IN LC-MS AND GC-MS SPECTROSCOPY, 2002.....	136
TABLE 96 SIGNIFICANT PATENTS IN ATOMIC ABSORPTION SPECTROSCOPY, 1997-2001.....	136
TABLE 97 PATENTS IN ATOMIC ABSORPTION SPECTROSCOPY, 2002.....	137
TABLE 98 SIGNIFICANT PATENTS IN FLUORESCENCE SPECTROSCOPY, 1997- 2001.....	137
TABLE 98 (CONTINUED).....	138
TABLE 99 PATENTS IN FLUORESCENCE SPECTROSCOPY, 2002.....	138
TABLE 99 (CONTINUED).....	139
TABLE 99 (CONTINUED).....	140
TABLE 100 SIGNIFICANT PATENTS IN X-RAY SPECTROSCOPY, 1997-2001.....	140
TABLE 101 PATENTS IN X-RAY SPECTROSCOPY, 2002.....	141
TABLE 101 (CONTINUED).....	142
PATENTS BY COMPANY.....	142
TABLE 102 PATENTS BY AGILENT TECHNOLOGIES, IN 2002.....	142
TABLE 103 PATENTS BY ANGSTROM TECHNOLOGIES, IN 2002.....	143
TABLE 104 PATENTS BY BRUKER COMPANIES, IN 2002.....	143
TABLE 105 PATENTS BY PERKIN-ELMER, IN 2002.....	143
TABLE 106 PATENTS BY SHIMADZU CORPORATION, IN 2002.....	144
TABLE 107 PATENTS BY THERMO COMPANIES, IN 2002.....	144
TABLE 108 PATENTS BY VARIAN, IN 2002.....	144
TABLE 109 PATENTS BY WATERS, IN 2002.....	145

TECHNOLOGY .....	146
NEW DEVELOPMENTS AND NEW TECHNIQUES .....	146
IR SPECTROSCOPY.....	146
RAMAN SPECTROSCOPY.....	146
UV-VISIBLE SPECTROSCOPY.....	147
NMR SPECTROSCOPY.....	148
ELECTRON SPECTROSCOPY.....	148
ATOMIC ABSORPTION SPECTROSCOPY.....	149
MASS SPECTROSCOPY .....	149
X-RAY SPECTROSCOPY .....	150

OPTICAL EMISSION SPECTROSCOPY .....	150
LC-MC/GC-MS .....	150
OTHER TYPES OF SPECTROSCOPY .....	150
Other Types of Spectroscopy (Continued) .....	151
INTERNATIONAL ASPECTS .....	152
EUROPE.....	152
ASIA.....	153
<i>TABLE 110 GLOBAL SALES OF SPECTROSCOPY INSTRUMENTS BY REGION,</i> <i>THROUGH 2007 (\$ MILLIONS)</i> .....	153
<i>FIGURE 44 GLOBAL SALES OF SPECTROSCOPY INSTRUMENTS BY REGION,</i> <i>2000-2007 (\$ MILLIONS)</i> .....	154
COMPANY PROFILES .....	155
AABSPEC INSTRUMENTATION CORPORATION .....	155
ABB BOMEM INC. ....	155
AGILENT TECHNOLOGIES.....	156
ANGSTROM, INC.....	156
APPLIED BIOSYSTEMS .....	156
AURORA INSTRUMENTS LTD.....	157
BECKMAN COULTER, INC.....	157
BRUKER AXS INC.....	158
BRUKER BIOSPIN CORPORATION.....	158
BRUKER DALTONICS INC. ....	158
BRUKER OPTICS INC.....	159
BUCK SCIENTIFIC INC.....	159
CIANFLONE SCIENTIFIC INSTRUMENTS CORPORATION.....	160
CVI LASER, INC. ....	160
DIGILAB, INC .....	160
EDAX, INC .....	161
GBC SCIENTIFIC EQUIPMENT PVT. LTD. ....	161
HITACHI HIGH TECHNOLOGIES AMERICA.....	161
INPHOTONICS, INC.....	162
ISS. INC. ....	162
JASCO. INC. ....	162
JEOL USA, INC.....	163
JOBIN YVON, INC.....	163
KAISER OPTICAL SYSTEM .....	163
KONTRON INSTRUMENTS .....	164
LECO CORPORATION .....	164
MIDAC CORPORATION.....	164
MDS SCIEX.....	165
OCEAN OPTICS .....	165
PANalytical, INC. ....	166
PERKIN-ELMER .....	166

PHOTON TECHNOLOGY INTERNATIONAL.....	167
RENISHAW, INC.....	167
SHIMADZU CORPORATION .....	167
SHIMADZU AMERICA/ SHIMADZU SCIENTIFIC INSTRUMENTS, INC. - USA .....	168
SPECTRO ANALYTICAL INSTRUMENTS INC.....	168
THERMO ELECTRON .....	169
THERMO ELEMENTAL.....	169
THERMO FINNIGAN .....	169
THERMO NICOLET CORPORATION .....	170
UNIVERSAL SYSTEMS.....	171
VARIAN, INC.....	171
WILKS ENTERPRISE, INC.....	172
WORLDWIDE ANALYTICAL SYSTEMS INC. ....	172
ZELTEX INC. ....	173
APPENDIX .....	174
<i>TABLE 111 NAICS VS. SIC: STRUCTURE AND NOMENCLATURE</i> .....	174