



# Forensic Technologies:

*New and Growing Markets*

October 2017

*Kevin Gainer*

Report Code: SAS003F

# Table of Contents

|  |           |
|--|-----------|
| <b>Chapter 1: Introduction</b> .....   | <b>1</b>  |
| Study Goals and Objectives.....  | 1         |
| Reasons for Doing This Study and Its Importance .....                        | 1         |
| Contributions of This Study and for Whom .....                               | 2         |
| Scope and Format of Report.....  | 2         |
| Methodology.....   | 2         |
| Information Sources.....   | 2         |
| Analyst's Credentials.....   | 4         |
| Related BCC Research Reports.....  | 4         |
| <b>Chapter 2: Summary and Highlights</b> .....                               | <b>6</b>  |
| Major Findings .....   | 6         |
| <b>Chapter 3: Overview</b> .....   | <b>10</b> |
| Definition of Forensic Science.....  | 10        |
| Forensics as an Economic Sector .....  | 10        |
| History of Forensic Science .....  | 10        |
| U.S. Forensic Laboratories .....   | 11        |
| Trends in Computerization of Crime Laboratories.....                         | 12        |
| Medical Examiners and Coroners .....   | 13        |
| Crime Rates and Forensic Backlogs.....                                       | 14        |
| Governmental Oversight of Forensics .....                                    | 15        |
| Criminal Justice and Forensic Science Reform Act of 2011.....                | 15        |
| Governmental Oversight .....   | 16        |
| The Growing Role of Forensic Databases .....                                 | 17        |
| Fingerprint Databases .....  | 17        |
| Next Generation Identification (NGI) .....                                   | 18        |
| Department of Defense Fingerprint/Biometrics .....                           | 19        |
| Forensic Databases.....  | 19        |
| Role of Forensic Science in the Legal System .....                           | 25        |
| Physical Evidence, Collection and Storage .....                              | 26        |
| Chain of Evidence or Custody.....  | 27        |
| Important Types of Evidence in Legal Proceedings.....                        | 27        |
| Analytical Processes Used in Forensic Testing .....                          | 28        |
| Major Forensic Testing Areas .....   | 29        |
| Role of New Technology in Reducing Forensic Backlogs .....                   | 37        |
| Forensic Science Instrumentation .....                                       | 37        |
| Chemical Analysis Instrumentation.....                                       | 38        |
| Drug Identification and Toxicology Analysis .....                            | 39        |
| DNA Profiling.....   | 41        |
| Nanotechnology .....   | 42        |
| Fingerprinting/Biometrics.....   | 43        |
| Forensic Imaging Market Including Handheld Devices.....                      | 44        |
| Portable Explosives Forensics Imaging Devices .....                          | 44        |
| Handheld Spectral Domain Optical Coherence Tomography (SD-OCT) Imaging ..... | 45        |
| Lab-On-a-Chip Portables .....  | 46        |
| Portable Cadaver Detection .....   | 46        |

|  |     |
|--|-----|
| Market Composition .....   | 47  |
| Government Regulation.....   | 47  |
| Accreditation .....  | 48  |
| Government Agencies .....  | 49  |
| International Markets .....  | 50  |
| Market Demand .....  | 51  |
| Testing Trends .....   | 51  |
| Markets for Forensic Analytical Techniques, Instruments and Supplies .....         | 52  |
| Organic Materials Analysis .....   | 53  |
| Combined DNA Index System (CODIS) .....  | 58  |
| Inorganic Materials Analysis.....  | 60  |
| General Analytical Instruments.....  | 62  |
| Major Analytical Categories .....  | 64  |
| Forensic Testing Market Size .....   | 71  |
| Analytical Instruments and Supplies .....  | 73  |
| Market Participants—Analytical Instruments .....                                   | 80  |
| Analytical Instruments Company Profiles .....                                      | 81  |
| Drug Identification Kits .....   | 88  |
| Drug Identification Kits Market Size.....  | 91  |
| Market Participants—Drug Identification Kits .....                                 | 91  |
| Market Shares .....  | 92  |
| Drug Field-Testing Kit Company Profiles .....                                      | 92  |
| Toxicology/Immunoassay Market.....   | 94  |
| Alcohol Analysis.....  | 94  |
| Drug and Poison Analysis .....   | 95  |
| Toxicology Immunoassay Reagents.....   | 96  |
| The Market for Forensic Toxicology Testing Products .....                          | 97  |
| Immunoassay Company Profiles .....   | 98  |
| Forensic Biology and Serology .....  | 99  |
| Blood Grouping .....   | 99  |
| Serological Characterization of Bloodstains.....                                   | 99  |
| Pattern Analysis of Bloodstains .....  | 100 |
| Bone Forensics and Skeletal Biology .....  | 101 |
| Market Size.....   | 101 |
| Forensic Biology and Serology Testing Company Profile .....                        | 102 |
| Fingerprinting/Biometrics .....  | 102 |
| Fingerprint Ridges and Ridge Characteristics.....                                  | 103 |
| Fingerprint Classification .....   | 103 |
| Integrated Automated Fingerprint Identification Systems (IAFIS).....               | 103 |
| IAFIS Enhancements: Automatic Feature Extraction and Matching (AFEM) .....         | 105 |
| Product Types and Applications .....   | 106 |
| Products for Obtaining Known or Criminal 10-Prints and Their Suppliers.....        | 107 |
| Products for Developing and Preserving Crime Scene Prints and Their Suppliers..... | 113 |
| Photography Supplies.....  | 115 |
| Magnifiers.....  | 116 |
| Digital Imaging Enhancement Software .....   | 116 |
| Market Size.....   | 117 |
| Market for 10-Print Products .....   | 119 |
| Market for Electronic Products .....   | 121 |
| Market for Crime Scene Print Products .....  | 121 |
| Market for AFIS.....   | 121 |

|   |            |
|---|------------|
| Fingerprinting Product Company Profiles .....                                   | 122        |
| DNA Testing .....   | 124        |
| Applications and Growth Rate .....  | 124        |
| Short Tandem Repeats .....  | 125        |
| Overseas Activities .....   | 127        |
| Interpol Global DNA Profiling Data .....  | 129        |
| DNA Testing Methods .....   | 130        |
| RFLP .....  | 131        |
| PCR .....   | 131        |
| STR Analysis (STR).....   | 134        |
| Mitochondrial DNA Analysis (mtDNA) .....  | 134        |
| Y-Chromosome Analysis.....  | 135        |
| Low Copy Number (LCN) DNA .....   | 135        |
| Analytical Instrumentation.....   | 136        |
| DNA Testing Products, Kits and Automation Company profiles .....                | 139        |
| DNA Matching .....  | 141        |
| CODIS.....  | 142        |
| DNA Identification Act of 1994.....   | 142        |
| The Role of DNA Evidence in Law Enforcement and in the Legal System Today ..... | 143        |
| Laboratories Performing DNA Analysis .....                                      | 143        |
| Private DNA Laboratory and Kit Provider Company Profiles .....                  | 144        |
| Market Size.....  | 150        |
| Federal Spending on DNA Backlog Reduction Program .....                         | 151        |
| Future Advances in DNA Profiling .....  | 153        |
| Forensic DNA Research Priorities.....   | 155        |
| Sequencing Software.....  | 163        |
| <b>Chapter 4: Technology .....</b>  | <b>165</b> |
| Techniques Used to Analyze Organic Forensic Evidence .....                      | 165        |
| Chromatography .....  | 165        |
| Spectrophotometry .....   | 170        |
| Immunoassay .....   | 173        |
| Techniques Used to Analyze Inorganic Forensic Evidence .....                    | 175        |
| Emission Spectroscopy .....   | 176        |
| Atomic Absorption (AA) Spectrophotometry.....                                   | 176        |
| Neutron Activation Analysis .....   | 177        |
| Techniques for Determining the Identity of Forensic Evidence .....              | 177        |
| General Analytical Instruments Used for Forensics and Applications .....        | 178        |
| Fluorescent Light Sources.....  | 180        |
| Firearms Identification Systems .....   | 180        |
| DNA Profiling .....   | 181        |
| <b>Chapter 5: Other Forensics Science Market Segments .....</b>                 | <b>189</b> |
| Overview .....  | 189        |
| Digital Evidence.....   | 189        |
| Trends in Digital Evidence .....  | 190        |
| Forensic Analysis of Cyberattacks .....   | 191        |
| Many New Market Entrants.....   | 192        |
| The Market for Digital Photography .....  | 192        |
| Digital Versus Conventional Photography.....                                    | 193        |
| Cybercrime and Computer Evidence Discovery.....                                 | 195        |

|  |            |
|--|------------|
| New Technology Issues Severely Impact Computer Forensics .....   | 197        |
| Forensic Image Processing .....  | 198        |
| Government Forensics Lab Initiatives.....  | 199        |
| New Forensic Tools .....   | 202        |
| Cell Phone Forensics.....  | 202        |
| Other PDAs .....   | 203        |
| Computer Evidence Company Profiles.....  | 206        |
| Computer Forensic Tools.....   | 218        |
| Forensic Accounting.....   | 218        |
| Laboratory Information Management Systems (LIMS) .....   | 218        |
| Bar Coding and Evidence Tracking .....   | 220        |
| Examples of LIMS Systems .....   | 221        |
| Software Forensics Tools .....   | 222        |
| Forensic Palynology .....  | 222        |
| Potential Revenue from Related Products.....   | 223        |
| <b>Chapter 6: Patents .....</b>  | <b>225</b> |
| Significance of Patents .....  | 225        |
| Examination of Recently Issued Patents.....  | 225        |
| Length of Time From Filing to Approval.....  | 226        |
| Companies Receiving Patents .....  | 226        |
| Selected Patent Abstracts .....  | 227        |
| System and Method for Forensic Cyber Adversary Profiling, Attribution and Attack Identification... 227 |            |
| System and Method for Conveying Session Information for Use in Forensic Watermarking..... 227          |            |
| Systems and Methods for Digital Forensic Triage .....  | 227        |
| Forensic Signature .....   | 228        |
| Method and Apparatus for Providing Forensic Visibility Into Systems and Networks .....                 | 228        |
| Method and System for Forensic Data Tracking .....   | 229        |
| Methods for Forensic DNA Quantitation .....  | 229        |
| Forensic System, Forensic Method, and Forensic Program .....   | 229        |
| Method and System for Forensic Investigation of Data Access .....                                      | 230        |
| Forensic Authentication System and Method.....   | 230        |
| Databases for rRNA Gene Profiling of Microbial Communities .....                                       | 230        |
| Remote Collection of Computer Forensic Evidence.....   | 231        |
| Enterprise Computer Investigation System.....  | 231        |
| Digital Forensic Analysis Using Empirical Privilege Profiling (EPP) For Filtering Collected Data ..... | 232        |
| Digital Forensic Analysis Using Empirical Privilege Profiling (EPP) For Filtering Collected Data ..... | 232        |
| Automated Forensic Document Signatures .....   | 233        |
| Xanthene Dyes Comprising a Sulfonamide Group .....   | 233        |
| Method for Determining Hard Drive Contents Through Statistical Drive Sampling .....                    | 233        |
| Methods for Rapid Multiplexed Amplification of Target Nucleic Acids .....                              | 234        |
| Automated Collection of Forensic Evidence Associated with a Network Security Incident .....            | 234        |
| System for Analyzing Forensic Evidence Using Image Filter and Method Thereof.....                      | 235        |
| Compositions and Methods for cDNA Synthesis.....   | 235        |
| Methods for Rapid Forensic Analysis of Mitochondrial DNA.....  | 235        |
| Forensic Identification.....   | 236        |
| Compositions and Methods for Reverse Transcriptase-Polymerase Chain Reaction (RT-PCR) .....            | 236        |
| Efficient and Secure Forensic Marking in Compressed Domain .....                                       | 237        |
| Fingerprint Scanning Systems and Methods.....  | 237        |
| Fragmented Data File Forensic Recovery System and Method .....   | 238        |

|   |            |
|---|------------|
| Computer System and Computer-Facilitated Method for Nucleic Acid Sequence Alignment and Analysis.....   | 238        |
| Methods for Identifying Bioagents.....  | 238        |
| Methods for Searching Forensic Data .....   | 239        |
| Forensic Toolkit and Method for Accessing Data Stored on Electronic Smart Cards .....   | 239        |
| Forensic Test Strip and Method for the Detection of Semen .....   | 240        |
| Forensic Integrated Search Technology with Instrument Weight Factor Determination.....  | 240        |
| Methods, Panels of Identification Markers, and Kits for Identifying Forensic Samples .....  | 240        |
| System and Method for Collecting DNA and Fingerprints .....   | 241        |
| Methods, Panels of Identification Markers, and Kits for Identifying Forensic Samples .....  | 241        |
| Adaptively Collecting Network Event Forensic Data.....  | 241        |
| Methods and Apparatuses for Sorting Objects in Forensic DNA Analysis and Medical Diagnostics ....   | 242        |
| Forensic Systems and Methods Using Search Packs That Can Be Edited for Enterprise-Wide Data Identification, Data Sharing and Management ..... | 242        |
| Compositions and Methods for Reverse Transcriptase-Polymerase Chain Reaction (RT-PCR) .....   | 243        |
| Method of Indexed Storage and Retrieval of Multidimensional Information .....   | 243        |
| Progressive Layered Forensic Correlation of Computer Network and Security Events .....  | 244        |
| Detection of Latent Prints by Raman Imaging.....  | 244        |
| Droplet-Based Nucleic Acid Amplification Method and Apparatus.....  | 245        |
| Helicase-Dependent Amplification of Nucleic Acids .....   | 245        |
| Method and Apparatus for Alignment, Comparison and Identification of Characteristic Tool Marks, Including Ballistic Signatures.....           | 245        |
| Capturing Air Samples for Forensic Investigation .....  | 246        |
| Complexity Management of Genomic DNA .....  | 246        |
| Methods for Rapid Forensic Analysis of Mitochondrial DNA and Characterization of Mitochondrial DNA Heteroplasmy .....                         | 247        |
| <b>Chapter 7: Company Contact Information and Product Focus Matrix.....</b>   | <b>249</b> |
| <b>Appendix: I.....</b>   | <b>255</b> |
| DNA Data Bank Laws by State in Effect as of May 2017, (Collected by The National Conference of State Legislatures).....                       | 255        |
| Surreptitious DNA Testing.....  | 260        |
| <b>Appendix: II.....</b>  | <b>267</b> |
| Partial Listing of Principal Forensic Crime Laboratories in the United States .....   | 267        |
| Alabama.....  | 267        |
| Alaska .....  | 267        |
| Arizona.....  | 267        |
| Arkansas .....  | 268        |
| California .....  | 268        |
| Colorado .....  | 271        |
| Connecticut .....   | 272        |
| Delaware .....  | 272        |
| Florida.....  | 272        |
| Georgia .....   | 273        |
| Hawaii.....   | 273        |
| Idaho.....  | 274        |
| Illinois .....  | 274        |
| Indiana .....   | 275        |
| IOWA .....  | 275        |

|                                       |            |
|---------------------------------------|------------|
| Kansas.....                           | 276        |
| Kentucky.....                         | 276        |
| Louisiana.....                        | 277        |
| Maine.....                            | 278        |
| Maryland.....                         | 278        |
| Massachusetts.....                    | 279        |
| Minnesota.....                        | 279        |
| Mississippi.....                      | 279        |
| Michigan.....                         | 280        |
| Missouri.....                         | 280        |
| Montana.....                          | 281        |
| Nebraska.....                         | 281        |
| Nevada.....                           | 281        |
| New Hampshire.....                    | 281        |
| New Jersey.....                       | 282        |
| New Mexico.....                       | 283        |
| New York.....                         | 283        |
| North Carolina.....                   | 285        |
| North Dakota.....                     | 285        |
| Ohio.....                             | 285        |
| Oklahoma.....                         | 286        |
| Oregon.....                           | 287        |
| Pennsylvania.....                     | 288        |
| Rhode Island.....                     | 288        |
| South Carolina.....                   | 288        |
| South Dakota.....                     | 289        |
| Tennessee.....                        | 289        |
| Texas.....                            | 289        |
| Utah.....                             | 290        |
| Vermont.....                          | 290        |
| Virginia.....                         | 290        |
| Washington.....                       | 291        |
| Washington, DC.....                   | 291        |
| West Virginia.....                    | 291        |
| Wisconsin.....                        | 292        |
| Wyoming.....                          | 292        |
| <b>Appendix: III.....</b>             | <b>294</b> |
| Select Forensic Consulting Firms..... | 294        |
| <b>Appendix: IV.....</b>              | <b>298</b> |
| Forensic Trade Shows.....             | 298        |
| <b>About BCC Research.....</b>        | <b>300</b> |
| About BCC Research.....               | 301        |
| BCC Membership.....                   | 301        |
| BCC Custom Research.....              | 301        |

# List of Tables

|   |     |
|---|-----|
| Summary Table U.S. Market for Forensic Products and Services by Segment, Through 2022 (\$ Millions) .                               | 8   |
| Table 1 Percentage of U.S. Laboratories Performing Various Forensic Functions (%) .....   | 14  |
| Table 2 States with Forensic Oversight Boards, 2013.....  | 16  |
| Table 3 U.S. Market for Forensic Database Products, by Sector, Through 2022 (\$ Millions).....                                      | 25  |
| Table 4 Publicly Operated Crime Laboratories Performing Certain Types of Analyses* (%).....   | 27  |
| Table 5 Vendors of Biometric-Based Fingerprint Identification Systems, 2017 .....   | 32  |
| Table 6 Companies by Major Areas of Participation in Analytical Testing .....   | 38  |
| Table 7 Vendors of Drug Identification Kits .....   | 39  |
| Table 8 Partial List of Suppliers of Solid-State Fingerprint Scanners .....   | 43  |
| Table 9 Laboratory Accreditation Statistics (% of Laboratories Accredited by a Professional Organization)<br>.....                  | 48  |
| Table 10 Crime Index Totals, Through 2011 .....   | 51  |
| Table 11 Crime Laboratory Workload Statistics, 2005 (Case Requests) .....   | 52  |
| Table 12 Forensic Applications by Instrument.....   | 54  |
| Table 13 Key CODIS Database Statistics, 2000-2010 .....   | 59  |
| Table 14 Significant Producers of Specialized Microscopes Used in Forensic Sciences .....   | 67  |
| Table 15 Most Successful NIBIN/IBIS Partners .....  | 70  |
| Table 16 U.S. Market for Forensic Product and Services, by Segment, Through 2022 (\$ Millions) .....                                | 72  |
| Table 17 U.S. Market for Forensic Analytical Instruments and Supplies, by Type, Through 2022 (\$<br>Millions) .....                 | 73  |
| Table 18 Prices and Numbers of Analytical Instruments in Forensic Laboratories/Departments (\$) .....                               | 75  |
| Table 19 U.S. Market for Forensic Chromatography and Mass Spectrometry Instruments and Supplies,<br>Through 2022 (\$ Millions)..... | 76  |
| Table 20 U.S. Market for Forensic Spectrophotometry Instruments, Through 2022 (\$ Millions).....                                    | 77  |
| Table 21 U.S. Market for Forensic Elemental Analysis Instruments, Through 2022 (\$ Millions) .....                                  | 78  |
| Table 22 U.S. Market for Forensic Optical and Scanning Electron Microscope, Through 2022 (\$ Millions)<br>.....                     | 78  |
| Table 23 Market Share of Optical Microscope Manufacturers, 2017 (%) .....   | 79  |
| Table 24 U.S. Market for Forensic Fluorescent Light Sources, Through 2022 (\$ Millions).....  | 80  |
| Table 25 Market Leaders Supplying Analytical Instruments.....   | 80  |
| Table 26 Arrests by Drug Type, 2011 (%).....  | 89  |
| Table 27 U.S. Market for Forensic Drug Identification Kits, Through 2022 (\$ Millions) .....  | 91  |
| Table 28 Market Shares of Drug Kit Companies, 2017 (%) .....  | 92  |
| Table 29 U.S. Market for Forensic Toxicology/Immunoassay, Through 2022 (\$ Millions) .....  | 97  |
| Table 30 Market Shares of Forensic Immunoassay Testing Participants, 2017 (%) .....   | 98  |
| Table 31 U.S. Market for Forensic Biology and Serology Testing, Through 2022 (\$ Millions).....                                     | 101 |
| Table 32 Fingerprinting Applications, Product Types and Suppliers .....   | 106 |
| Table 33 Complete List of Live Scan Fingerprint System Manufacturers .....  | 108 |
| Table 34 Complete List of Card Scan Fingerprint System Manufacturers .....  | 111 |
| Table 35 Portable Mobile ID Fingerprint Scan Products and Vendors .....   | 112 |
| Table 36 U.S. Market for Forensic Fingerprinting, by Product Type, Through 2022 (\$ Millions) .....                                 | 117 |
| Table 37 Pricing Costs Per Unit for Fingerprint Systems and Supplies (\$).....  | 119 |
| Table 38 Estimated Number of Criminal Fingerprint Cards Submitted to the FBI, 2003 Versus 2011 ....                                 | 120 |
| Table 39 Status of European Union Member State DNA Databases, Database Entry Criteria by Country,<br>2017 .....                     | 127 |
| Table 40 Use Rates for Amplification Kits .....   | 131 |



|  |     |
|--|-----|
| Table 41 Most Frequently Used PCR Kits by Vendor .....   | 132 |
| Table 42 Examples of Applied Biosystems DNA Kits.....  | 133 |
| Table 43 Sequencing Analyzer Placements in DNA Testing Laboratories, 2002* (Response From 106 Facilities) (%) .....            | 137 |
| Table 44 NDIS Approved Expert Systems.....   | 139 |
| Table 45 Case Workload Statistics, 1999 and 2000 .....   | 144 |
| Table 46 Federal Funding for the DNA Testing Backlog Reduction Program, Through 2020 (\$ Millions) 152                         |     |
| Table 47 U.S. Forensic DNA Testing Convicted Offender, Arrestee and Case Data Completed Tests, Through 2016 (\$ Millions)..... | 152 |
| Table 48 U.S. Market for Forensic DNA Testing by Product Type, Through 2022 (\$ Millions).....                                 | 153 |
| Table 49 Forensic DNA Research and Development .....   | 158 |
| Table 50 Research and Development Priorities in Use of DNA for Forensic Identification.....                                    | 187 |
| Table 51 Principal Application Areas for UV-IR Forensic Photography.....   | 194 |
| Table 52 RCFL Program Highlights, Through 2014.....  | 199 |
| Table 53 Examples of National Science Foundation Funding for Computer Forensics Research (\$) .....                            | 200 |
| Table 54 PDA Forensic Tools .....  | 204 |
| Table 55 Percent of Crime Laboratories with LIMS by Type of Jurisdiction, Through 2009 (%).....                                | 219 |
| Table 56 Annual Revenues from Related Products, 2016 (\$ Millions) .....   | 223 |
| Table 57 Forensic Patents by Classification, 2008 Through 2017.....  | 225 |
| Table 58 Duration of Patent Filing to Approval, 2008-2017 .....  | 226 |
| Table 59 Recently Issued Forensic Patents by Inventor/Assignee, Sample of 151, 2008 Through June 2017 .....                    | 226 |
| Table 60 Company Contact Information and Product Focus Matrix .....  | 249 |
| Table 61 Status of State Laws on DNA Databanks (Circumstances Under Which Samples Are Required) .....                          | 256 |
| Table 62 Organizations That Regularly Sponsor Forensic Trade Shows, Upcoming Calendar .....                                    | 298 |

# List of Figures

|   |     |
|---|-----|
| Summary Figure U.S. Market for Forensic Products and Services by Segment, 2016-2022 (\$ Millions) ....  | 8   |
| Figure 1 U.S. Market for Forensic Product and Services, 2017 Versus 2022 (%).....                       | 72  |
| Figure 2 U.S. Market for Forensic Analytical Instruments and Supplies, by Type, 2016-2022 (\$ Millions) | 74  |
| Figure 3 U.S. Market for Forensic Drug Identification Kits, 2016-2022 (\$ Millions) .....               | 91  |
| Figure 4 U.S. Market for Forensic Toxicology/Immunoassay,2016-2022 (\$ Millions) .....                  | 97  |
| Figure 5 U.S. Market for Forensic Biology and Serology Testing, 2016-2022 (\$ Millions).....            | 102 |
| Figure 6 U.S. Market for Forensic Fingerprinting, by Product Type, 2016-2022 (\$ Millions) .....        | 118 |
| Figure 7 Gas Chromatography Schematic Diagram .....   | 166 |
| Figure 8 Mass Spectrometer .....  | 169 |
| Figure 9 Major Hyphenated Spectroscopy Techniques .....   | 170 |
| Figure 10 UV/Visible Spectroscope Schematic Diagram.....  | 171 |
| Figure 11 Principal Elements of an IR Spectrometer .....  | 172 |
| Figure 12 Elements of an FT-IR Spectrometer .....   | 173 |
| Figure 13 The Basic Enzyme Immunoassay (EIA) Process.....   | 174 |
| Figure 14 Principal Elements of an Atomic Absorption Spectrometer .....                                 | 177 |
| Figure 15 The PCR Process .....   | 183 |



*About BCC Research*

## *About BCC Research*

With our unparalleled 45-year history, BCC Research provides comprehensive analysis of global market sizing, forecasting and industry intelligence, covering markets where advances in science and technology are improving the quality, standard and sustainability of businesses, economies and lives.

## *BCC Membership*

From market sizing and forecasts, to opportunity assessments and competitive analyses, our ever-expanding library gives you the data, insights and intelligence required to ensure your project is a success. Members benefit from ongoing, unlimited access to the category or collections of their choice, and most membership packages pay for themselves within two to three reports being accessed.

Did you buy this report? You may qualify to apply your purchase price towards a full membership. Call 866/31285-7215 or email [info@bccresearch.com](mailto:info@bccresearch.com) to request a demo.

## *BCC Custom Research*

Our experts provide custom research projects to those working to identify new markets, introduce new products, validate existing market share, analyze competition and assess the potential for products to impact existing markets. With impressive academic credentials and broad and deep knowledge of global industrial markets, our independent analysts and consultants develop the facts, figures, analysis and assessments to inform the decisions that will move your company ahead. Confidential inquiries to: [custom@bccresearch.com](mailto:custom@bccresearch.com) or 781/205-2429.

## DISCLAIMER

The information developed in this report is intended to be as reliable as possible at the time of publication and is of a professional nature. This information does not constitute managerial, legal or accounting advice, nor should it be considered as a corporate policy guide, laboratory manual or an endorsement of any product, as much of the information is speculative in nature. BCC Research and the author assume no responsibility for any loss or damage that might result from reliance on the reported information or from its use.

ISBN: 1-62296-558-2  
October 2017