

Contents

Preface	xiii
1 Laboratory Safety	1
2 Equipping Your Forensics Laboratory	5
Optical Equipment	5
Laboratory Equipment.....	13
Chemicals and Reagents.....	19
Specimens	26
Group I Soil Analysis	31
Lab I-1 Gather and Prepare Soil Samples	35
Equipment and Materials	35
Background	36
Procedure I-1-1: Gather Soil Specimens	37
Procedure I-1-2: Dry Soil Specimens	38
Review Questions	40
Lab I-2 Examine the Physical Characteristics of Soil	43
Equipment and Materials	43
Background	44
Procedure I-2-1: Observe and Categorize Soil Color	44
Procedure I-2-2: Determine Soil Density	46
Procedure I-2-3: Determine Soil Settling Time.....	48
Procedure I-2-4: Determine Soil Particle Size Distribution	49
Review Questions	52
Lab I-3 Examine the Microscopic Characteristics of Soil	55
Equipment and Materials	55
Background	56
Procedure I-3-1: Examine Soil Specimens under Magnification	57
Review Questions	58
Lab I-4 Assay Phosphate Concentrations in Soil Specimens	61
Equipment and Materials	61
Background	62
Procedure I-4-1: Extract Soil Specimens.....	63
Procedure I-4-2: Assay Soil Phosphate Concentrations	64
Review Questions	65

Lab I-5	Examine the Spectroscopic Characteristics of Soil	67
	Equipment and Materials	67
	Background	68
	Procedure I-5-1: Extract Ion Species from Soil Specimens	69
	Procedure I-5-2: Test Soil Specimen Extracts with the Spectrometer	69
	Procedure I-5-3: Identify Ions Present in Exemplar	72
	Review Questions	73
Group II	Hair and Fiber Analysis.....	75
Lab II-1	Gathering Hair Specimens	79
	Equipment and Materials	79
	Background	80
	Procedure II-1-1: Obtain Hair Specimens with Forceps	81
	Procedure II-1-2: Obtain Hair Specimens with Lift Tape	82
	Review Questions	83
Lab II-2	Study the Morphology of Human Scalp Hair.....	85
	Equipment and Materials	85
	Background	86
	Procedure II-2-1: Macroscopic Examination of Human Scalp Hair	87
	Procedure II-2-2: Wet-Mount Hair Specimens	88
	Procedure II-2-3: Microscopic Examination of Human Scalp Hair	89
	Review Questions	91
Lab II-3	Make Scale Casts of Hair Specimens.....	93
	Equipment and Materials	93
	Background	93
	Procedure II-3-1: Make and Observe Scale Casts of Human Hair	95
	Review Questions	96
Lab II-4	Study the Morphology of Animal Hair.....	99
	Equipment and Materials	99
	Background	100
	Procedure II-4-1: Observe Animal Hair	101
	Review Question.....	101
Lab II-5	Individualize Human Hair Specimens.....	103
	Equipment and Materials	103
	Background	104
	Procedure II-5-1: Obtain Hair Specimens.....	105
	Procedure II-5-2: Observe and Characterize Hair Specimens	105
	Review Questions	106
Lab II-6	Physical and Chemical Tests of Fibers	109
	Equipment and Materials	109
	Background	110
	Procedure II-6-1: Test Fiber Specimens by Burning	111
	Procedure II-6-2: Test Fiber Specimens by Solubility	115
	Procedure II-6-3: Test Fiber Specimens by Dye Stripping.....	118

	Procedure II-6-4: Test Fiber Specimens by Dyeing	120
	Review Questions	122
Lab II-7	Study the Morphology of Fibers and Fabrics.....	127
	Equipment and Materials	127
	Background	128
	Procedure II-7-1: Macroscopic Examination of Fabrics	129
	Procedure II-7-2: Microscopic Examination of Fibers and Fabrics.....	130
	Procedure II-7-3: Cross-Sectional Examination of Fiber Specimens	132
	Procedure II-7-4: Determine the Refractive Index of Fibers with RI Matching Liquids	134
	Procedure II-7-5: Examining Fibers by Polarized Light.....	139
	Review Questions	141
Group III	Glass and Plastic Analysis	145
Lab III-1	Determine Densities of Glass and Plastic Specimens.....	149
	Equipment and Materials	149
	Background	150
	Procedure III-1-1: Determine Density by Displacement.....	152
	Procedure III-1-2: Determine Density by Flotation	153
	Review Questions	154
Lab III-2	Compare Refractive Indices of Glass and Plastic Specimens	157
	Equipment and Materials	157
	Background	158
	Procedure III-2-1: Compare RI of Questioned and Known Specimens	159
	Review Question.....	160
Lab III-3	Observe Shatter Patterns	163
	Equipment and Materials	163
	Background	164
	Procedure III-3-1: Produce Glass Shards.....	164
	Procedure III-3-2: Observe and Compare Glass Shards.....	165
	Review Questions	165
Group IV	Revealing Latent Fingerprints	167
Lab IV-1	Dusting and Lifting Latent Fingerprints	177
	Equipment and Materials	177
	Background	177
	Procedure IV-1-1: Dusting Latent Fingerprints	178
	Procedure IV-1-2: Lifting Developed Fingerprints.....	179
	Review Questions.....	180
Lab IV-2	Revealing Latent Fingerprints Using Iodine Fuming.....	183
	Equipment and Materials	183
	Background	184
	Procedure IV-2-1: Fuming Latent Fingerprints with Iodine	185
	Review Questions.....	187

Lab IV-3	Revealing Latent Fingerprints Using Ninhydrin	189
	Equipment and Materials	189
	Background	190
	Procedure IV-3-1: Developing Latent Fingerprints with Ninhydrin	191
	Procedure IV-3-2: Ninhydrin After-Treatments	192
	Review Questions	193
Lab IV-4	Revealing Latent Fingerprints Using Superglue Fuming	197
	Equipment and Materials	197
	Background	198
	Procedure IV-4-1: Preparing for Superglue Fuming.....	199
	Procedure IV-4-2: Fuming Latent Fingerprints with Superglue	199
	Procedure IV-4-3: Dusting and Lifting Superglue-fumed Fingerprints.....	200
	Review Questions	201
Lab IV-5	Revealing Latent Fingerprints On Sticky Surfaces	203
	Equipment and Materials	203
	Background	204
	Procedure IV-5-1: Preparing Specimens for Gentian Violet Development.....	205
	Procedure IV-5-2: Developing Specimens with Gentian Violet	205
	Review Questions	207
Lab IV-6	Revealing Latent Fingerprints On Brass Cartridge Cases	209
	Equipment and Materials	209
	Background	210
	Procedure IV-6-1: Treat Specimens with Acidified Hydrogen Peroxide.....	210
	Review Question.....	211
Group V	Detecting Blood.....	213
Lab V-1	Testing the Sensitivity and Selectivity of Kastle-Meyer Reagent.....	217
	Equipment and Materials	217
	Background	218
	Procedure V-1-1: Prepare Known Dilutions of Blood.....	219
	Procedure V-1-2: Spot Known Dilutions of Blood	220
	Procedure V-1-3: Test Sensitivity of Kastle-Meyer Reagent.....	221
	Procedure V-1-4: Test Selectivity of Kastle-Meyer Reagent.....	222
	Procedure V-1-5: Field Testing with Kastle-Meyer Reagent	222
	Review Questions	223
Group VI	Impression Analysis	227
Lab VI-1	Tool Mark Analysis	231
	Equipment and Materials	231
	Background	232
	Procedure VI-1-1: Produce and Compare Compression Specimens.....	233
	Procedure VI-1-2: Produce and Compare Scoring Specimens.....	235
	Review Questions	236

Lab VI-2	Matching Images to Cameras	239
	Equipment and Materials	239
	Background	239
	Procedure VI-2-1: Matching Films to Cameras.....	241
	Procedure VI-2-1: Forensic Examination of Digital Image Files	243
	Review Questions.....	244
Lab VI-3	Perforation and Tear Analysis	247
	Equipment and Materials	247
	Background	247
	Procedure VI-3-1: Produce and Examine Tape Specimens.....	248
	Review Question.....	249
Group VII	Forensic Drug Testing	251
Lab VII-1	Presumptive Drug Testing	253
	Equipment and Materials	253
	Background	256
	Procedure VII-1-1: Testing Specimens Against Presumptive Reagents.....	260
	Procedure VII-1-2: Verifying Test Results.....	261
	Review Questions.....	263
Lab VII-2	Detect Cocaine and Methamphetamine on Paper Currency	265
	Equipment and Materials	265
	Background	266
	Procedure VII-2-1: Testing a Control Specimen	266
	Procedure VII-2-2: Testing Currency for Cocaine.....	267
	Procedure VII-2-3: Testing Currency for Methamphetamine	268
	Review Questions.....	270
Lab VII-3	Analysis of Drugs by Chromatography	273
	Equipment and Materials	273
	Background	274
	Procedure VII-3-1: Prepare Chromatography Jars and Strips.....	275
	Procedure VII-3-2: Prepare Solutions of Known and Questioned Specimens.....	276
	Procedure VII-3-3: Spot and Develop the Chromatograms	277
	Procedure VII-3-4: Visualize the Chromatograms.....	278
	Review Questions.....	279
Lab VII-4	Observation of Drug Microcrystalline Structures and Precipitation Reactions	281
	Equipment and Materials	281
	Background	282
	Procedure VII-4-1: Preparing Solutions of Known and Questioned Specimens	282
	Procedure VII-4-2: Observing microcrystalline Structures	283
	Procedure VII-4-3: Analysis of Drugs by Precipitation.....	284
	Review Questions.....	285

Lab VII-5	Assay Vitamin C in Urine by Iodometric Titration	287
	Equipment and Materials	287
	Background	288
	Procedure VII-5-1: Prepare a Standard Vitamin C Solution	289
	Procedure VII-5-2: Titrate the Standard Vitamin C Solution	290
	Procedure VII-5-3: Titrate the Questioned Urine Specimen.....	291
	Review Questions.....	292
Group VIII	Forensic Toxicology	295
Lab VIII-1	Salicylate Determination by Visual Colorimetry	299
	Equipment and Materials	299
	Background	300
	Procedure VIII-1-1: Prepare an Array of Salicylate Concentrations	302
	Procedure VIII-1-2: Test the Reagent	302
	Procedure VIII-1-3: Test the Questioned Specimen(s)	303
	Review Questions.....	304
Lab VIII-2	Detect Alkaloid Poisons with Dragendorff's Reagent.....	307
	Equipment and Materials	307
	Background	308
	Procedure VIII-2-1: Prepare Questioned Alkaloid Specimens.....	309
	Procedure VIII-2-2: Test Specimens for the Presence of Alkaloids.....	310
	Procedure VIII-2-3: Analyze Alkaloids Using Paper Chromatography	311
	Review Questions.....	313
Group IX	Gunshot and Explosive Residues Analysis	315
Lab IX-1	Presumptive Color Tests for Gunshot Residue.....	317
	Equipment and Materials	317
	Background	318
	Procedure IX-1-1: Produce Gunshot Residue (GSR) Specimens	321
	Procedure IX-1-2: Make up Modified Griess Reagent Test Paper	323
	Procedure IX-1-3: Test for Nitrite Residue in GSR Specimens.....	324
	Procedure IX-1-4: Test White GSR Specimens for Lead Residue	325
	Procedure IX-1-5: Test Colored or Patterned GSR Specimens for Lead Residue	327
	Review Questions.....	328
Lab IX-2	Presumptive Color Tests for Explosives Residues.....	331
	Equipment and Materials	331
	Background	332
	Procedure IX-2-1: Test Known Specimens	336
	Procedure IX-2-2: Extract Explosives Residues.....	336
	Procedure IX-2-3: Test Swabs for Explosives Residues	337
	Review Questions.....	338
Group X	Detecting Altered and Forged Documents.....	341

Lab X-1	Revealing Alterations in Documents.....	345
	Equipment and Materials	345
	Background	346
	Procedure X-1-1: Test Ink Solvents	347
	Procedure X-1-2: Produce Questioned Document Specimens.....	348
	Procedure X-1-3: Examine Questioned Documents by Visible and Ultraviolet Light	349
	Procedure X-1-4: Examine Questioned Documents Microscopically	350
	Procedure X-1-5: Examine Questioned Documents by Iodine Fuming	350
	Procedure X-1-6: Examine Questioned Documents by Chemical Treatment.....	351
	Review Questions	351
Lab X-2	Analysis of Inks by Chromatography.....	353
	Equipment and Materials	353
	Background	354
	Procedure X-1-1: Prepare Chromatography Jars	356
	Procedure X-1-2: Prepare the Questioned Ink Specimen.....	356
	Procedure X-1-3: Prepare and Spot Chromatograms	357
	Procedure X-1-4: Develop Chromatograms	357
	Review Questions	359
Lab X-3	Forensic Analysis of Paper	361
	Equipment and Materials	361
	Background	362
	Procedure X-3-1: Examine Paper Specimens Visually.....	364
	Procedure X-3-2: Examine Paper Specimens Microscopically	364
	Procedure X-3-3: Examine Paper Specimens by Differential Staining	364
	Review Questions.....	365
Group XI	Forensic Biology	369
Lab XI-1	Pollen Analysis.....	373
	Equipment and Materials	373
	Background	374
	Procedure XI-1-1: Examining Known and Questioned Pollen Grains.....	376
	Review Questions.....	376
Lab XI-2	Diatom Analysis.....	379
	Equipment and Materials	379
	Background	380
	Procedure XI-2-1: Digest Diatom Specimens.....	382
	Procedure XI-2-2: Mount and Observe Diatoms	383
	Review Questions.....	384

Lab XI-3	Extract, Isolate, and Visualize DNA	387
	Equipment and Materials	387
	Background	388
	Procedure XI-3-1: Extract DNA.....	389
	Procedure XI-3-2: Isolate DNA.....	389
	Procedure XI-3-1: Visualize DNA	390
	Review Questions	391
Lab XI-4	DNA Analysis by Gel Electrophoresis	393
	Equipment and Materials	393
	Background	394
	Procedure XI-3-1: Build a Gel Electrophoresis Apparatus	398
	Procedure XI-3-2: Prepare DNA Specimens	401
	Procedure XI-3-3: Prepare and Cast Gel(s)	401
	Procedure XI-3-4: Load and Run the DNA Specimens	403
	Procedure XI-3-5: Stain and Visualize the Gel(s)	404
	Review Questions	404
Index		407