

CONTENTS

Author Biography	xxiii
Preface	xxv
Acknowledgments	xxvii
About the Companion Website	xxix
Part 1 General Concepts, 1	
1 Basic Definitions. Claims. Classification of Cosmetics and OTC Drug–Cosmetic Products	3
Learning Objectives, 3	
Key Concepts, 4	
1.1 What Is Cosmetic Science?, 5	
1.2 Basic Definitions, 8	
1.2.1 United States, 8	
1.2.2 Other Markets, 10	
1.3 How is a Product’s Intended Use Established in the US?, 13	
1.4 Classification of Cosmetics and OTC Drug–Cosmetic Products, 14	
1.5 Cosmetic Claims, 15	
1.5.1 Types of Claims, 15	
1.5.2 Regulation of Cosmetic Claims in the US, 17	
1.5.3 Popular Cosmetic Claims, 18	
1.6 A Special Category: Soap, 27	
Glossary of Terms, 28	
Abbreviations, 30	
References, 30	

2	Cosmetic Ingredients and Active Ingredients Used in OTC Drug–Cosmetic Products	33
	Learning Objectives, 33	
	Key Concepts, 34	
2.1	Cosmetic Ingredients, 35	
2.1.1	Abrasives, 35	
2.1.2	Antioxidants, 36	
2.1.3	Chelating Agents, 37	
2.1.4	Color Additives, 38	
2.1.5	Exfoliants, 41	
2.1.6	Film Formers, 42	
2.1.7	Flavoring Agents, 42	
2.1.8	Fragrances, 43	
2.1.9	Moisturizers, 45	
2.1.10	pH Adjusters, 46	
2.1.11	pH Buffers, 46	
2.1.12	Plasticizers, 46	
2.1.13	Preservatives, 47	
2.1.14	Propellants, 48	
2.1.15	Silicones, 48	
2.1.16	Solvents, 49	
2.1.17	Surfactants, 50	
2.1.18	Sweeteners, 53	
2.1.19	Thickeners, 53	
2.2	Active Ingredients, 55	
2.2.1	Anti-Acne Ingredients, 56	
2.2.2	Anticavity Ingredients, 57	
2.2.3	Anti-Dandruff Ingredients, 57	
2.2.4	Antiperspirant Ingredients, 57	
2.2.5	Skin Protectant Ingredients, 58	
2.2.6	Topical Antiseptic Ingredients, 58	
2.2.7	UV Filters, 59	
	Glossary of Terms, 59	
	Abbreviations, 61	
	References, 62	
3	Product forms for Cosmetics and OTC Drug–Cosmetic Products	65
	Learning Objectives, 65	
	Key Concepts, 66	
3.1	Introduction, 66	
3.2	What is a Product Form?, 67	
3.3	Product Forms for Cosmetic Applications, 68	
3.3.1	Solution, 68	
3.3.2	Emulsion, 69	
3.3.3	Suspension, 72	
3.3.4	Ointment, 74	

- 3.3.5 Paste, 75
- 3.3.6 Gel, 75
- 3.3.7 Powder, 76
- 3.3.8 Capsule, 77
- 3.3.9 Stick, 77
- 3.3.10 Aerosol, 77
- Glossary of Terms, 78
- Abbreviations, 79
- References, 80

- 4 Government and Independent Organizations in the Cosmetic Industry 81**
 - Learning Objectives, 81
 - Key Concepts, 82
 - 4.1 Introduction, 83
 - 4.2 Food and Drug Administration, 83
 - 4.2.1 FDA Center for Food Safety and Applied Nutrition (CFSAN), 84
 - 4.2.2 FDA Center for Drug Evaluation and Research (CDER), 84
 - 4.3 Personal Care Product Council, 85
 - 4.4 Cosmetic Ingredient Review Expert Panel, 85
 - 4.5 Federal Trade Commission, 86
 - 4.6 National Advertising Division, 87
 - 4.7 Environmental Protection Agency, 87
 - 4.8 International Fragrance Association (IFRA), 88
 - 4.9 Research Institute for Fragrance Materials (RIFM), 88
 - 4.10 Flavor and Extract Manufacturers Association (FEMA), 88
 - 4.11 European Commission, 89
 - 4.12 Scientific Committee on Consumer Safety, 89
 - 4.13 Cosmetics Europe – the Personal Care Association, 89
 - Glossary of Terms, 90
 - Abbreviations, 90
 - References, 91
- 5 Current Rules and Regulations for Cosmetics and OTC Drug–Cosmetic Products in the United States and European Union 93**
 - Learning Objectives, 93
 - Key Concepts, 94
 - 5.1 Introduction, 95
 - 5.2 Regulation in the US, 95
 - 5.2.1 Registration of Manufacturing Facilities and Products, 95
 - 5.2.2 Premarket Approval, 97
 - 5.2.3 Manufacturing, 98
 - 5.2.4 Use of Ingredients, 98
 - 5.2.5 Product Safety, 99
 - 5.2.6 Packaging and Labeling, 101

5.2.7	Import of Products, 102	
5.2.8	Recalls, 102	
5.3	Regulation in the EU, 104	
5.3.1	Registration of Manufacturing Facilities and Products, 105	
5.3.2	Premarket Approval, 105	
5.3.3	Manufacturing, 105	
5.3.4	Use of Ingredients, 105	
5.3.5	Product Safety, 106	
5.3.6	Packaging and Labeling, 107	
5.3.7	Import of Products, 107	
5.3.8	Recalls, 107	
	Glossary of Terms, 108	
	Abbreviations, 108	
	References, 109	
6	Cosmetic Good Manufacturing Practices	111
	Learning Objectives, 111	
	Key Concepts, 112	
6.1	Cosmetic Good Manufacturing Practices, 112	
6.1.1	Documentation, 115	
6.1.2	Records, 115	
6.1.3	Buildings and Facilities, 116	
6.1.4	Equipment, 116	
6.1.5	Personnel, 116	
6.1.6	Raw Materials, 117	
6.1.7	Production, 117	
6.1.8	Laboratory Controls, 117	
6.1.9	Internal Audit, 117	
6.1.10	Complaints, Adverse Events, and Recalls, 117	
	Glossary of Terms, 119	
	Abbreviations, 120	
	References, 120	
7	Labeling Tutorial for Cosmetics and OTC Drug–Cosmetic Products Marketed in the United States. INCI Names	121
	Learning Objectives, 121	
	Key Concepts, 122	
7.1	Introduction, 123	
7.1.1	Definitions, 124	
7.2	Cosmetic Products, 125	
7.2.1	Principal Display Panel, 125	
7.2.2	Information Panels, 127	
7.3	OTC Drug–Cosmetic Products, 130	
7.3.1	Principal Display Panel, 130	
7.3.2	Information Panels, 131	

7.4	INCI Naming, 134	
7.5	Do You Know the Exact Composition of a Cosmetic Product or OTC Drug–Cosmetic Product?, 136	
	Glossary of Terms, 137	
	Abbreviations, 138	
	References, 139	
8	Testing of Cosmetics and OTC Drug–Cosmetic Products	141
	Learning Objectives, 141	
	Key Concepts, 142	
8.1	Product Development Cycle, 143	
8.2	Product Testing, 144	
	8.2.1 Quality Testing, 145	
	8.2.2 Stability Testing, 147	
	8.2.3 Safety Testing, 150	
	8.2.4 Performance Testing, 153	
	Glossary of Terms, 156	
	Abbreviations, 157	
	References, 157	
Part 2 Skin Care Products, 161		
9	Skin Anatomy and Physiology	163
	Learning Objectives, 163	
	Key Concepts, 164	
9.1	Introduction, 165	
9.2	Structure and Function of Human Skin, 165	
	9.2.1 Epidermis, 165	
	9.2.2 Dermis, 170	
	9.2.3 Hypodermis, 172	
9.3	Main Characteristics of Human Skin, 172	
	9.3.1 Moisture Content of Normal Skin, 172	
	9.3.2 Skin Flora and Skin pH, 174	
	9.3.3 Surface Charge of Normal Skin, 175	
	9.3.4 Skin Types, 175	
	Glossary of Terms, 178	
	Abbreviations, 180	
	References, 180	
10	Skin Cleansing Products	183
	Learning Objectives, 183	
	Key Concepts, 185	
10.1	Introduction, 186	
10.2	Types and Definition of Skin Cleansing Products, 186	

- 10.3 History of Using Skin Cleansing Products, 187
- 10.4 How Skin Cleansers May Affect the Skin, 188
- 10.5 Required Characteristics and Consumer Needs, 191
- 10.6 Basic Concepts of Skin Cleansing Products, 191
 - 10.6.1 Classification Based on Chemical Nature and Mildness, 191
 - 10.6.2 Classification Based on Cleaning Principle, 192
 - 10.6.3 Classification Based on Foamability, 193
 - 10.6.4 Classification Based on Product Types, 194
- 10.7 Typical Ingredients and Formulation of Skin Cleansing Products, 195
 - 10.7.1 Facial Cleansers, 195
 - 10.7.2 Body Cleansers, 200
 - 10.7.3 Hand Cleansers, 206
- 10.8 Considerations When Selecting Skin Cleansing Products, 211
- 10.9 Typical Quality Problems of Skin Cleansing Products, 212
 - 10.9.1 Sticky Bath Salts and Bath Bombs, 212
 - 10.9.2 Broken Bath Bombs, 213
 - 10.9.3 Discoloration of Bar Soaps, 213
 - 10.9.4 Poor Foaming Activity of Foaming Formulations, 213
 - 10.9.5 Separation of Emulsions, 213
 - 10.9.6 Cloudy Solution, 215
 - 10.9.7 Microbiological Contamination, 215
 - 10.9.8 Clump formation, 216
 - 10.9.9 Rancidity, 216
- 10.10 Evaluation of Skin Cleansing Products, 216
 - 10.10.1 Quality Parameters Generally Tested, 216
 - 10.10.2 Efficacy (Performance) Parameters Generally Tested, 229
- 10.11 Ingredients Causing Safety Concerns, 231
 - 10.11.1 Parabens, 231
 - 10.11.2 Sulfates, 232
 - 10.11.3 1,4-Dioxane, 232
 - 10.11.4 Microbeads, 233
- 10.12 Packaging of Skin Cleansing Products, 233
 - Glossary of Terms, 234
 - Abbreviations, 236
 - References, 237

11 Skin Moisturizing Products

243

- Learning Objectives, 243
- Key Concepts, 244
- 11.1 Introduction, 245
- 11.2 Types and Definition of Skin Moisturizers, 245
- 11.3 History of Using Skin Moisturizers, 246
- 11.4 How Skin Moisturizers May Affect the Skin, 247

11.5	Required Characteristics and Consumer Needs, 249	
11.6	Typical Ingredients and Formulation of Skin Moisturizers, 249	
11.6.1	Skin Hydrating and Moisturizing Ingredients, 250	
11.6.2	Additional Ingredients in Skin Moisturizers, 254	
11.7	Product Types, 256	
11.7.1	Formulation of Skin Moisturizers, 258	
11.8	Considerations When Selecting Skin Moisturizers, 259	
11.9	Typical Quality Issues of Skin Moisturizer Formulations, 260	
11.10	Evaluation of Skin Moisturizing Products, 260	
11.10.1	Quality Parameters Generally Tested, 260	
11.10.2	Efficacy (Performance) Parameters Generally Tested, 260	
11.11	Ingredients Causing Safety Concerns, 267	
11.12	Packing of Skin Moisturizers, 268	
	Glossary of Terms, 269	
	Acronyms, 270	
	References, 270	
12	Products for Aging	275
	Learning Objectives, 275	
	Key Concepts, 276	
12.1	Introduction, 277	
12.2	Changes in Skin Structure and Function During Aging, 277	
12.2.1	Intrinsic Aging, 277	
12.2.2	Extrinsic Aging, 279	
12.3	Drug or Cosmetic?, 281	
12.4	Typical Ingredients Used in Topical Antiaging Products, 282	
12.4.1	Botanical Extracts, 283	
12.4.2	Antioxidants, 283	
12.4.3	Peptides and Proteins, 284	
12.4.4	Retinoids, 284	
12.4.5	Hydroxy Acids, 285	
12.4.6	Sunscreens, 286	
12.4.7	Chemical Peels, 286	
12.5	Formulation Considerations of Topical Antiaging Products, 287	
12.6	Formulation Challenges of Common Antiaging Ingredients, 290	
12.7	Safety Concerns Regarding the Use of Topical Noninvasive Antiaging Ingredients, 291	
12.7.1	AHAs, 292	
12.7.2	Topical Retinoids, 292	
12.7.3	Peptides and Proteins, 292	
12.8	Packing of Antiaging Products, 293	
	Glossary of Terms, 293	
	Abbreviations, 294	
	References, 295	

13	Products for Acne	301
	Learning Objectives, 301	
	Key Concepts, 302	
13.1	Introduction, 302	
13.2	Anatomy and Physiology of the Pilosebaceous Unit, 303	
13.3	Development of Acne, 304	
	13.3.1 Pathogenesis of Acne, 304	
	13.3.2 Causes of Acne and Potential Exacerbating Factors, 305	
13.4	Symptoms and Types of Acne Vulgaris, 307	
	13.4.1 Noninflammatory Acne, 307	
	13.4.2 Inflammatory Acne, 308	
13.5	Treatment of Acne Vulgaris, 309	
	13.5.1 Topical Treatment Options, 309	
	13.5.2 Systemic Treatment Options, 312	
	13.5.3 Additional Treatment Options, 313	
13.6	Formulation Considerations, 314	
13.7	Ingredients Causing Safety Concerns, 315	
	13.7.1 Topical Ingredients, 315	
	13.7.2 Oral Retinoids, 315	
	13.7.3 Antibacterial Resistance, 316	
13.8	Packaging of Anti-Acne Products, 316	
	Glossary of Terms, 316	
	Abbreviations, 317	
	References, 317	
14	Skin Lightening Products	323
	Learning Objectives, 323	
	Key Concepts, 324	
14.1	Introduction, 325	
14.2	Skin Color and Production of Melanin, 325	
14.3	Common Hyperpigmentation Lesions, 327	
14.4	History of Using Skin Lightening Products, 329	
14.5	Drug or Cosmetic?, 329	
14.6	How Skin Lightening Products May Affect the Skin, 330	
14.7	Required Characteristics and Consumer Needs, 331	
14.8	Typical Ingredients used in Skin Lightening Products, 331	
	14.8.1 Mechanism of Action, 331	
	14.8.2 Ingredients, 332	
14.9	Formulation Considerations and Challenges for Topical Skin Lightening Products, 334	
14.10	Important Considerations When Using Skin Lightening Products, 335	
14.11	Typical Quality Issues of Skin Lightening Formulations, 336	
14.12	Evaluation of Skin Lightening Products, 336	
	14.12.1 Quality Parameters Generally Tested, 336	
	14.12.2 Performance (Efficacy) Parameters Generally Tested, 336	

- 14.13 Ingredients Causing Safety Concerns, 339
 - 14.13.1 Hydroquinone, 339
 - 14.13.2 Topical Retinoids, 339
 - 14.13.3 Chemical Peels, 339
- 14.14 Packaging of Skin Lightening Products, 340
 - Glossary of Terms, 340
 - Abbreviations, 341
 - References, 341

15 Sun Care Products

347

- Learning Objectives, 347
- Key Concepts, 348
- 15.1 Introduction, 349
- 15.2 Sun Protection Basics, 350
 - 15.2.1 The Light Spectrum, 350
 - 15.2.2 UV Radiation, 351
 - 15.2.3 Sun Protection Factor, 353
 - 15.2.4 Broad Spectrum Protection, 355
 - 15.2.5 Water Resistance, 356
- 15.3 Effects of UV Radiation on the Human Body, 356
- 15.4 Types and Definition of Sun Care Products, 358
- 15.5 History of Using Sun Care Products, 359
- 15.6 Required Characteristics and Consumer Needs, 360
- 15.7 Sunscreens, 361
 - 15.7.1 UV Filters, 361
 - 15.7.2 Additional Sunscreen Ingredients, 363
 - 15.7.3 Photoprotection Boosting Technologies to Optimize Product Efficacy and Consumer Acceptance, 365
 - 15.7.4 Product Forms, 367
 - 15.7.5 Formulation of Sunscreens, 369
- 15.8 After-Sun Products, 370
 - 15.8.1 Sunburn, 370
 - 15.8.2 Skin Care after Sun Exposure, 370
- 15.9 Typical Quality Problems of Sun Care Products, 371
 - 15.9.1 Valve Clogging, 371
- 15.10 Evaluation of Sun Care Products, 371
 - 15.10.1 Quality Parameters Generally Tested, 371
 - 15.10.2 Performance (Efficacy) Parameters Generally Tested, 378
- 15.11 Ingredients Causing Safety Concerns, 380
 - 15.11.1 Skin Absorption of Organic UV Filters, 380
 - 15.11.2 Photoirritation from Organic UV Filters, 380
 - 15.11.3 Coral Bleaching, 381
 - 15.11.4 Nanoparticles in Sunscreens, 381
- 15.12 Packaging of Sun Care Products, 382
 - Glossary of Terms, 383
 - Abbreviations, 385
 - References, 385

Part 3 Hair Care Products, 393

- 16 Hair Anatomy And Physiology 395**
 Learning Objectives, 395
 Key Concepts, 396
 16.1 Introduction, 396
 16.2 Structure and Function of Human Hair, 397
 16.3 Main Characteristics of Human Hair, 400
 16.3.1 Hair Growth Cycle and Hair Loss, 400
 16.3.2 Chemical Composition of Human Hair, 402
 16.3.3 Physical Properties of Human Hair, 405
 16.3.4 Hair Types, 406
 Glossary of Terms, 409
 Abbreviations, 411
 References, 411
- 17 Hair Cleansing and Conditioning Products 413**
 Learning Objectives, 413
 Key Concepts, 414
 17.1 Introduction, 415
 17.2 Types and Definition of Hair Cleansing and Conditioning Products, 415
 17.3 History of Using Hair Cleansing and Conditioning Products, 416
 17.4 How Hair Cleaning and Conditioning Products May Affect the Hair and Scalp, 416
 17.5 Required Characteristics and Consumer Needs, 418
 17.6 Hair Cleansing Products, 419
 17.6.1 Cleansing Basics, 419
 17.6.2 Typical Ingredients of Shampoos, 419
 17.6.3 Types and Formulation of Shampoos, 422
 17.7 Hair Conditioners, 426
 17.7.1 Conditioning Ingredients of Conditioners, 427
 17.7.2 Types of and Formulation of Conditioners, 428
 17.8 Typical Quality Issues of Hair Cleansing and Conditioning Products, 430
 17.9 Evaluation of Hair Cleansing and Conditioning Products, 430
 17.9.1 Quality Parameters Generally Tested, 430
 17.9.2 Performance (Efficacy) Parameters Generally Tested, 430
 17.10 Ingredients Causing Safety Concerns, 432
 17.10.1 Sulfates and Laureth Sulfates, 432
 17.11 Packaging of Hair Cleansing and Conditioning Products, 433
 Glossary of Terms, 433
 Abbreviations, 434
 References, 434
- 18 Hair Styling Products, Hair Straightening Products, and Hair Waving Products 439**
 Learning Objectives, 439
 Key Concepts, 441
 18.1 Introduction, 442

- 18.2 Types and Definition of Hair Styling, Hair Straightening, and Hair Waving Products, 442
- 18.3 History of Using Hair Styling, Hair Waving, and Hair Straightening Products, 443
- 18.4 How Hair Styling Products and Procedures May Affect the Hair and Scalp, 444
- 18.5 Required Characteristics and Consumer Needs, 446
- 18.6 Hair Styling Products, 447
 - 18.6.1 Polymer-Based Hair Styling Products, 447
 - 18.6.2 Emollient-Based Hair Styling Products, 450
- 18.7 Hair Styling Procedures, 452
 - 18.7.1 Temporary Hair Curling and Straightening Tools, 452
 - 18.7.2 Permanent Hair Waving and Straightening Procedures, 454
- 18.8 Typical Quality Issues of Hair Styling, Hair Waving, and Hair Straightening Products, 460
 - 18.8.1 Valve Clogging, 460
 - 18.8.2 Poor Foaming of Hair Mousses, 461
 - 18.8.3 Unstable Foam, 461
- 18.9 Evaluation of Hair Styling, Hair Waving, and Hair Straightening Products, 461
 - 18.9.1 Quality Parameters Generally Tested, 461
 - 18.9.2 Performance Parameters of Hair Styling Products Generally Tested, 461
 - 18.9.3 Performance Parameters of Permanent Waving Products Generally Tested, 464
- 18.10 Ingredients Causing Safety Concerns, 465
 - 18.10.1 Volatile Organic Compounds, 465
 - 18.10.2 Inhalation of Aerosol Droplets, 466
 - 18.10.3 Thioglycolates, 466
 - 18.10.4 Hydroxides, 467
 - 18.10.5 Formaldehyde, 467
- 18.11 Packaging of Hair Styling, Hair Waving, and Hair Straightening Products, 468
 - Glossary of Terms, 468
 - Abbreviations, 470
 - References, 470
- 19 Hair Coloring Products** **475**
 - Learning Objectives, 475
 - Key Concepts, 476
 - 19.1 Introduction, 477
 - 19.2 Types and Definition of Hair Coloring Products, 477
 - 19.3 History of Using Hair Coloring Products, 478
 - 19.4 How Hair Coloring Products May Affect the Scalp and Hair, 479
 - 19.5 Required Characteristics and Consumer Needs, 481
 - 19.6 Current US Regulation of Hair Dyes, 481

- 19.7 Types, Typical Ingredients, and Formulation of Hair Coloring Products, 482
 - 19.7.1 Non-Oxidative Products, 482
 - 19.7.2 Oxidative Products, 486
 - 19.7.3 Formulation of Hair Coloring Products, 489
- 19.8 Typical Quality Issues of Hair Coloring Products, 489
- 19.9 Evaluation of Hair Coloring Products, 490
 - 19.9.1 Quality Parameters Generally Tested, 490
 - 19.9.2 Efficacy (Performance) Parameters Generally Tested, 490
- 19.10 Ingredients Causing Safety Concerns, 490
 - 19.10.1 Oxidative Hair Dyes, 490
 - 19.10.2 Lead Acetate, 492
- 19.11 Packaging of Hair Coloring Products, 492
 - Glossary of terms, 492
 - Abbreviations, 494
 - References, 494

Part 4 Color Cosmetics, 497

20 Lip Makeup Products

499

- Learning Objectives, 499
- Key Concepts, 500
- 20.1 Introduction, 501
- 20.2 Anatomy and Physiology of Human Lips, 501
- 20.3 History of Using Lip Makeup Products, 503
- 20.4 Types and Definition of Lip Makeup Products, 504
- 20.5 How Lip Makeup Products May Affect the Lips, 505
- 20.6 Required Characteristics and Consumer Needs, 506
- 20.7 Typical Ingredients of Lip Makeup Products, 506
- 20.8 Common Types of Lip Makeup Products, 509
- 20.9 Formulation of Lip Makeup Products, 511
 - 20.9.1 Molding, 511
 - 20.9.2 Additional Methods, 513
- 20.10 Typical Quality Issues of Lip Makeup Products, 515
 - 20.10.1 Aeration, 515
 - 20.10.2 Laddering, 516
 - 20.10.3 Chipping or Cracking, 516
 - 20.10.4 Deformation, 516
 - 20.10.5 Cratering, 516
 - 20.10.6 Streaking, 516
 - 20.10.7 Sweating, 516
 - 20.10.8 Mushy Failure, 517
 - 20.10.9 Seams, 517
 - 20.10.10 Bleeding, 517
 - 20.10.11 Poor Payoff, 517
- 20.11 Evaluation of Lip Makeup Products, 517
 - 20.11.1 Quality Parameters Generally Tested, 517
 - 20.11.2 Performance (Efficacy) Parameters Generally Tested, 519

- 20.12 Ingredient Causing Safety Concerns, 519
 - 20.12.1 Lead Content, 519
- 20.13 Packaging of Lip Makeup Products, 520
 - Glossary of Terms, 520
 - Abbreviations, 522
 - References, 522
- 21 Eye Makeup Products 525**
 - Learning Objectives, 525
 - Key Concepts, 526
 - 21.1 Introduction, 527
 - 21.2 Anatomy and Physiology of Human Eyelids and Eyelashes, 527
 - 21.3 History of Using Eye Makeup Products, 528
 - 21.4 Types and Definition of Eye Makeup Products, 529
 - 21.5 How Eye Makeup Products May Affect the Eye Area, 530
 - 21.6 Required Characteristics and Consumer Needs, 532
 - 21.7 Typical Ingredients and Formulation of Eye Makeup Products, 533
 - 21.7.1 Mascara, 533
 - 21.7.2 Eyeliner, 537
 - 21.7.3 Eyebrow Liner, 537
 - 21.7.4 Eyeshadow, 538
 - 21.7.5 Eye Makeup Removers, 540
 - 21.8 Typical Quality Issues of Eye Makeup Products, 541
 - 21.8.1 Breaking, 541
 - 21.8.2 Sticking, 542
 - 21.8.3 Smudging, 542
 - 21.8.4 Drying up, 542
 - 21.9 Evaluation of Eye Makeup Products, 543
 - 21.9.1 Quality Parameters Generally Tested, 543
 - 21.10 Safety Testing of Eye Cosmetics, 547
 - 21.11 Packaging of Eye Makeup Products, 548
 - Glossary of Terms, 549
 - Abbreviations, 550
 - References, 550
- 22 Facial Makeup Products 553**
 - Learning Objectives, 553
 - Key Concepts, 554
 - 22.1 Introduction, 555
 - 22.2 Types and Definition of Facial Makeup Products, 555
 - 22.3 History of Using Facial Makeup Products, 556
 - 22.4 How Facial Makeup Products May Affect the Skin, 557
 - 22.5 Required Characteristics and Consumer Needs, 559
 - 22.6 Typical Ingredients and Formulation of Facial Makeup Products, 559
 - 22.6.1 Powder Makeup Products for the Face, 560
 - 22.6.2 Liquid and Semisolid Makeup Products for the Face, 563

- 22.6.3 Other Facial Makeup Products, 566
- 22.7 Typical Quality Issues of Facial Makeup Products, 567
- 22.8 Evaluation of Facial Makeup Products, 568
 - 22.8.1 Quality Parameters Generally Tested, 568
- 22.9 Ingredients Causing Safety Concerns, 568
 - 22.9.1 Talc, 568
- 22.10 Packaging of Facial Makeup Products, 570
 - Glossary of Terms, 570
 - Abbreviations, 571
 - References, 571

23 Nail Care Products

575

- Learning Objectives, 575
- Key Concepts, 576
- 23.1 Introduction, 577
- 23.2 Anatomy and Physiology of Human Nails, 577
- 23.3 History of Using Nail Care Products, 579
- 23.4 Types and Definition of Nail Care Products, 580
- 23.5 How Nail Care Products May Affect the Human Nails, 581
- 23.6 Required Characteristics and Consumer Needs, 583
- 23.7 Functional Nail Care Products, 583
 - 23.7.1 Nail Hardeners, 583
 - 23.7.2 Nail Moisturizers, 584
 - 23.7.3 Chemical Cuticle Removers, 585
- 23.8 Decorative Nail Care Products, 585
 - 23.8.1 Nail Polish, 585
 - 23.8.2 Artificial Nail Products, 590
- 23.9 Nail Polish Removers, 593
 - 23.9.1 Ingredients, 593
 - 23.9.2 Types of Nail Polish Removers, 593
- 23.10 Typical Quality Issues of Nail Care Products, 594
 - 23.10.1 Bubbling, 594
 - 23.10.2 Cracking, 594
 - 23.10.3 Chipping, 595
 - 23.10.4 Thickening, 595
- 23.11 Evaluation of Nail Care Products, 595
 - 23.11.1 Quality Parameters Generally Tested, 595
- 23.12 Ingredients Causing Safety Concerns, 598
 - 23.12.1 Toluene, 599
 - 23.12.2 Phthalates, 599
 - 23.12.3 Methylene Glycol (“Formaldehyde”), 600
 - 23.12.4 UV Nail Lamps, 600
- 23.13 Packaging of Nail Care Products, 600
 - Glossary of Terms, 601
 - Abbreviations, 602
 - References, 602

Part 5 Additional Personal Care Products, 607

24	Oral and Dental Care Products	609
	Learning Objectives, 609	
	Key Concepts, 610	
24.1	Introduction, 611	
24.2	Anatomy and Physiology of the Human Oral Cavity, 612	
24.3	Review of the Most Common Oral and Dental Care Problems, 613	
24.4	History of Using Oral and Dental Care Products, 617	
24.5	Types and Definition of Oral and Dental Care Products, 618	
24.6	How Oral and Dental Care Products May Affect the Teeth and the Oral Cavity, 619	
24.7	Required Characteristics and Consumer Needs, 620	
24.8	Typical Ingredients and Formulation of Oral and Dental Care Products, 621	
24.8.1	Toothpaste, 621	
24.8.2	Mouthwash, 630	
24.8.3	Other Products, 633	
24.8.4	Tooth Powders, 634	
24.8.5	Dental Floss, 634	
24.9	Typical Quality Issues of Oral and Dental Care Products, 635	
24.9.1	Hardening, 635	
24.9.2	Inappropriate Viscosity, 635	
24.9.3	Grittiness, 636	
24.9.4	Cloudy Solution, 636	
24.10	Evaluation of Dental and Oral Care Products, 636	
24.10.1	Quality Parameters Generally Tested, 636	
24.10.2	Efficacy (Performance) Parameters Generally Tested, 636	
24.11	Ingredients Causing Safety Concerns, 637	
24.11.1	Fluoride, 638	
24.11.2	Hydrogen Peroxide, 639	
24.12	Packaging of Dental and Oral Care Products, 639	
	Glossary of Terms, 640	
	Abbreviations, 641	
	References, 642	
25	Hair Removal Products	647
	Learning Objectives, 647	
	Key Concepts, 648	
25.1	Introduction, 649	
25.2	Review of the Structure and Function of Human Hair, 649	
25.3	History of Using Hair Removal Methods, 651	
25.4	Possible Methods for Removing Hair, 652	
25.4.1	Temporary Methods, 653	
25.4.2	Permanent Methods, 655	
25.5	Types and Definition of Hair Removal Products, 656	

- 25.6 How Hair Removal Products May Affect the Skin and Hair, 657
- 25.7 Required Characteristics and Consumer Needs, 659
- 25.8 Types, Typical Ingredients, and Formulation of Hair Removal Products, 660
 - 25.8.1 Pretreatment Products, 660
 - 25.8.2 Shaving Products, 661
 - 25.8.3 Chemical Depilatories, 666
 - 25.8.4 Waxes, 668
 - 25.8.5 Aftertreatment Products, 670
- 25.9 Typical Quality Issues of Hair Removal Products, 671
 - 25.9.1 Brittle Wax, 671
- 25.10 Evaluation of Hair Removal Products, 671
 - 25.10.1 Quality Parameters Generally Tested, 671
 - 25.10.2 Efficacy (Performance) Parameters Generally Tested, 672
- 25.11 Ingredients Causing Safety Concerns, 672
 - 25.11.1 Thioglycolates, 672
 - 25.11.2 Volatile Organic Compounds, 672
- 25.12 Packaging of Hair Removal Products, 673
 - Glossary of Terms, 673
 - Abbreviations, 674
 - References, 674

26 Deodorants and Antiperspirants

677

- Learning Objectives, 677
- Key Concepts, 678
- 26.1 Introduction, 679
- 26.2 Anatomy and Physiology of Human Sweat Glands, 679
- 26.3 Types and Definition of Products Reducing Body Odor, 682
- 26.4 History of Using Deodorants and Antiperspirants, 683
- 26.5 How Deodorants and Antiperspirants May Affect the Human Skin and Body, 684
- 26.6 Required Characteristics and Consumer Needs, 685
- 26.7 The Mechanism of Action of Deodorant and Antiperspirant Ingredients, 685
- 26.8 Most Common Product Forms of Deodorants and Antiperspirants, 687
 - 26.8.1 Roll-Ons, 688
 - 26.8.2 Solid Sticks, 688
 - 26.8.3 Extrudable Clear Gels, 689
 - 26.8.4 Extrudable Soft Solids, 689
 - 26.8.5 Aerosols, 690
- 26.9 Formulation of Deodorant and Antiperspirant Products, 691
- 26.10 Typical Quality Issues of Deodorants and Antiperspirants, 692
 - 26.10.1 Shrinkage of Extrudable Gels, 692
 - 26.10.2 Caking of Aerosols, 692
 - 26.10.3 Valve Clogging, 693
 - 26.10.4 Staining and Fabric Damage, 693
 - 26.10.5 Poor Pay-Off, 693

- 26.11 Evaluation of Deodorants and Antiperspirants, 694
 - 26.11.1 Quality Parameters Generally Tested, 694
 - 26.11.2 Efficacy (Performance) Parameters Generally Tested, 695
- 26.12 Ingredients Causing Safety Concerns, 696
 - 26.12.1 Aluminum, 697
 - 26.12.2 Zirconium, 698
 - 26.12.3 Volatile Organic Compounds, 698
- 26.13 Packaging of Deodorants and Antiperspirants, 698
 - Glossary of Terms, 699
 - Abbreviations, 700
 - References, 700

- 27 Baby Care Products 705**
 - Learning Objectives, 705
 - Key Concepts, 706
 - 27.1 Introduction, 707
 - 27.2 Anatomical and Physiological Differences Between Baby and Adult Skin and Hair, 707
 - 27.2.1 Skin, 708
 - 27.2.2 Hair, 709
 - 27.2.3 Other Areas, 709
 - 27.3 Types and Definition of Baby Care Products, 710
 - 27.4 History of Using Baby Care Products, 711
 - 27.5 How Baby Care Products May Affect Baby Skin, Hair, and Eyes, 711
 - 27.6 Required Characteristics and Consumer Needs, 714
 - 27.7 Types, Typical Ingredients, and Formulation of Baby Care Products, 714
 - 27.7.1 Formulation Considerations, 714
 - 27.7.2 Cleansing Products for Babies, 715
 - 27.7.3 Protecting Products for Babies, 718
 - 27.8 Typical Quality Issues of Baby Care Products, 722
 - 27.9 Evaluation of Baby Care Products, 722
 - 27.9.1 Quality Parameters Generally Tested, 722
 - 27.9.2 Performance (Efficacy) Parameters Generally Tested, 723
 - 27.10 Ingredients Causing Safety Concerns, 723
 - 27.10.1 Talc, 723
 - 27.11 Packaging of Baby Care Products, 724
 - Glossary of Terms, 725
 - Abbreviations, 725
 - References, 726

- 28 Feminine Hygiene Products 731**
 - Learning Objectives, 731
 - Key Concepts, 732
 - 28.1 Introduction, 733
 - 28.2 Anatomy and Physiology of the Female Genital Area, 733
 - 28.2.1 Vulva, 734
 - 28.2.2 Vagina, 734

- 28.3 Types and Definition of Feminine Hygiene Products, 736
- 28.4 History of Using Feminine Hygiene Products, 738
- 28.5 How Feminine Hygiene Products May Affect the Human Body and Female Genital Area, 739
- 28.6 Required Qualities and Characteristics and Consumer Needs, 741
- 28.7 Types, Typical Ingredients, and Formulation of Feminine Hygiene Products, 741
 - 28.7.1 Cleansing and Deodorizing Products, 741
 - 28.7.2 Feminine Moisturizers and Lubricants, 744
 - 28.7.3 Topical Anti-Itch and Antifungal Medications, 747
- 28.8 Typical Quality Issues of Feminine Hygiene Products, 748
 - 28.8.1 Abnormal Shape of Vaginal Suppositories, 748
- 28.9 Evaluation of Feminine Hygiene Products, 748
 - 28.9.1 Quality Parameters Generally Tested, 748
 - 28.9.2 Performance (Efficacy) Parameters Generally Tested, 749
- 28.10 Ingredients Causing Safety Concerns, 749
 - 28.10.1 Talc, 749
 - 28.10.2 Lubricants' Effect on the Lactobacillus Species, 750
- 28.11 Packaging of Feminine Hygiene Products, 750
 - Glossary of Terms, 751
 - Abbreviations, 752
 - References, 752

- 29 Sunless Tanning Products 757**
 - Learning Objectives, 757
 - Key Concepts, 758
 - 29.1 Introduction, 758
 - 29.2 Types and Definition of Sunless Tanning Products, 759
 - 29.3 History of Using Sunless Tanning Products, 759
 - 29.4 How Sunless Tanners May Affect the Human Body, 760
 - 29.5 Required Characteristics and Consumer Needs, 762
 - 29.6 Types and Typical Ingredients of Sunless Tanning Products, 762
 - 29.6.1 Tanning Ingredients, 762
 - 29.6.2 Main Product Forms, 764
 - 29.7 Formulation Considerations, 765
 - 29.8 Typical Quality Problems of Sunless Tanners, 767
 - 29.8.1 Discoloration and Malodor Formation, 767
 - 29.9 Evaluation of Sunless Tanners, 767
 - 29.9.1 Quality Parameters Generally Tested, 767
 - 29.9.2 Performance Evaluation, 767
 - 29.10 Ingredients Causing Safety Concerns, 768
 - 29.10.1 DHA, 768
 - 29.11 Packaging of Sunless Tanning Products, 769
 - Glossary of Terms, 769
 - Abbreviations, 770
 - References, 770