

Contents

<i>Preface</i>	<i>iii</i>
1. INTRODUCTION	1
I. General Background	1
II. Toxicity of Chemicals in the Environment	2
III. Accidents with Chemicals	6
IV. Waste and Minimization	13
V. Conclusions	18
VI. Summary of Some Important Points	19
References	20
Recommended Reading	25
Exercises	25
2. DOING WITHOUT PHOSGENE	27
I. Introduction	27
II. Preparation of Isocyanates	28
III. Polycarbonates	39
IV. Summary and Conclusions	39
References	42
Recommended Reading	45
Exercises	45
3. THE CHLORINE CONTROVERSY	47
I. The Problem	47
II. Toxicity of Chlorine Compounds	50
III. Estrogen Mimics	51
IV. Bleaching Paper	52
V. Disinfecting Water	53
VI. Chlorofluorocarbons and Ozone Depletion	54
VII. Chlorinated Solvents	57
VIII. Syntheses Where the Chlorine Is Not in the Final Product	58

IX.	Summary and Conclusions	60
	References	61
	Recommended Reading	66
	Exercises	66
4.	TOXIC HEAVY METAL IONS	67
	I. The Problem	67
	II. End-of-the-Pipe Treatments	70
	III. Biocides	72
	IV. Catalysts for Reactions Other than Oxidation	74
	V. Dyes and Pigments	75
	VI. Electrical Uses	76
	VII. Leather	77
	VIII. Metal Finishing	77
	IX. Oxidation	78
	X. Miscellaneous	94
	References	94
	Recommended Reading	101
	Exercises	101
5.	SOLID CATALYST AND REAGENTS FOR EASE OF WORKUP	101
	I. Introduction	103
	II. The Use of Inorganic Supports	105
	III. Ion-Exchange Resins	114
	IV. Combinatorial Chemistry	118
	V. Other Uses of Supported Reagents	120
	VI. Cyclodextrins	126
	References	128
	Recommended Reading	135
	Exercises	135
6.	SOLID ACIDS AND BASES	137
	I. Introduction	137
	II. Polymeric Sulfonic Acids	138
	III. Polymer-Supported Lewis Acids	139
	IV. Sulfated Zirconia	140
	V. Supported Metal Oxides	141
	VI. Rare Earth Triflates	141
	VII. Solid Bases	144
	VIII. Zeolites and Related Materials	145
	IX. Clays	155
	X. Heteropolyacids	159
	References	163
	Recommended Reading	173
	Exercises	173
7.	CHEMICAL SEPARATIONS	175
	I. The General Picture	175
	II. Inclusion Compounds	178

III.	Separation of Ions	182
IV.	Membrane Separations	185
	References	192
	Recommended Reading	200
	Exercises	200
8.	WORKING WITHOUT ORGANIC SOLVENTS	201
I.	Advantages and Disadvantages of Solvents	201
II.	Working Without Solvents	203
III.	Reactions in Extruders	207
IV.	Carbon Dioxide as a Solvent	210
V.	Water as a Reaction Medium	214
VI.	Surfactants and Cleaning	220
VII.	Coatings	223
	References	228
	Recommended Reading	229
	Exercises	229
9.	BIOCATALYSIS AND BIODIVERSITY	241
I.	Biocatalysis	241
II.	Biodiversity	267
	References	275
	Recommended Reading	288
	Exercises	288
10.	STEREOCHEMISTRY	291
I.	The Importance of Optical Isomers	291
II.	The Chiral Pool	292
III.	Resolution of Racemic Mixtures	295
IV.	Asymmetric Synthesis	301
	References	314
	Recommended Reading	318
	Exercises	318
11.	AGROCHEMICALS	319
I.	The Nature and Use of Agrochemicals	319
II.	Problems with Agrochemicals	322
III.	Alternative Agriculture	326
IV.	Lawns	345
V.	Genetic Engineering	346
VI.	Integrated Pest Management	347
	References	348
	Recommended Reading	358
	Exercises	358

12. MATERIALS FOR A SUSTAINABLE ECONOMY	361
I. Introduction	361
II. Commodity Chemicals from Renewable Raw Materials	361
III. Use of Natural Polymers	372
IV. Polymers from Renewable Raw Materials	374
V. Conclusions and Recommendations	379
References	379
Recommended Reading	385
Exercises	385
13. CHEMISTRY OF LONGER WEAR	387
I. Why Things Wear Out	387
II. Stabilizers for Polymers	389
III. Lubrication, Wear, and Related Subjects	395
IV. Inhibition of Corrosion	397
V. Mending	400
VI. Miscellaneous	400
VII. The Future	401
References	401
Recommended Reading	405
Exercises	405
14. CHEMISTRY OF RECYCLING	407
I. Waste	407
II. Recycling	408
III. Methods and Incentives for Source Reduction	424
IV. The Overall Picture	431
References	432
Recommended Reading	440
Exercises	440
15. ENERGY AND THE ENVIRONMENT	441
I. Energy-Related Problems	441
II. Heating, Cooling, and Lighting Buildings	449
III. Renewable Energy for Electricity and Transport	454
IV. Use of Less Common Forms of Energy for Chemical Reactions	462
References	466
Recommended Reading	478
Exercises	479
16. POPULATION AND THE ENVIRONMENT	481
I. The Problems	481
II. Chemistry of Human Reproduction	483
III. The Chemistry of Family Planning	485
IV. Summary of the Problem	491

References	492
Recommended Reading	495
Exercises	495
17. ENVIRONMENTAL ECONOMICS	497
I. Introduction	497
II. Nature's Services	497
III. Environmental Accounting	499
IV. Corporations	503
V. Environmental Economics of Individuals	505
VI. Government Actions Affecting Environmental Economics	507
References	511
Recommended Reading	515
Exercises	515
18. GREENING	517
I. Introduction	517
II. Individuals	517
III. Nongovernmental Organizations	519
IV. Government	521
V. Corporations	523
References	529
Recommended Reading	534
Exercises	534
<i>Index</i>	535