
Contents

<i>About the authors</i>	ix
<i>Preface to the third edition</i>	xi
<i>About the companion website</i>	xv
PART 1: LABORATORY PRACTICE	1
1 Safety in the chemical laboratory	3
1.1 Essential rules for laboratory safety	4
1.2 Hazardous chemicals	7
1.3 Disposal of hazardous waste	11
1.4 Accident procedures	12
2 Glassware and equipment in the laboratory	15
2.1 Glass equipment	16
2.2 Hardware	21
2.3 Heating	24
2.4 Stirring	30
2.5 Vacuum pumps	32
2.6 The rotary evaporator	42
2.7 Catalytic hydrogenation	46
2.8 Ozonolysis	48
2.9 Irradiation	50
2.10 Compressed gases	54
3 Organic reactions: From starting materials to pure organic product	61
3.1 Handling chemicals	62
3.2 The reaction	81
3.3 Purification of organic compounds	105
4 Qualitative analysis of organic compounds	185
4.1 Purity	185
4.2 Determination of structure using chemical methods	202

5	Spectroscopic analysis of organic compounds	207
5.1	Absorption spectroscopy	207
5.2	Infrared spectroscopy	209
5.3	Nuclear magnetic resonance spectroscopy	227
5.4	Ultraviolet spectroscopy	279
5.5	Mass spectrometry	295
6	Keeping records: The laboratory notebook and chemical literature	311
6.1	The laboratory notebook	312
6.2	The research report	322
6.3	The chemical literature	327
	PART 2: EXPERIMENTAL PROCEDURES	329
	Introduction	331
	List of experiments	333
	Experiments that can be taken in sequence	353
	Experiments that can be used to compare directly different techniques for undertaking a reaction	354
	Experiments that illustrate particular techniques	354
7	Functional group interconversions	355
7.1	Simple transformations	355
7.2	Reactions of alkenes	366
7.3	Substitution	386
7.4	Reduction	390
7.5	Oxidation	424
7.6	Rearrangements	436
8	Carbon–carbon bond-forming reactions	443
8.1	Grignard and organolithium reagents	444
8.2	Enolate anions	456
8.3	Heteroatom-stabilized carbanions	484
8.4	Aromatic electrophilic substitution	504
8.5	Pericyclic reactions	514
8.6	Metal-mediated coupling reactions	534
9	Experiments using enabling technologies	545
9.1	Microwave chemistry	545
9.2	Flow chemistry	554

10	Projects	569
10.1	Natural product isolation and identification	569
10.2	Project in organic synthesis	578
10.3	Aspects of physical organic chemistry	608
APPENDICES		627
Organic solvents		629
Spectroscopic correlation tables		635
Index of chemicals		649
General index		657