Contents

Preface *page* xi

1. Stereochemical Topology 1
Examples of Topologically Complex Molecules 2
Stereoisomers 7
Chirality 13
Chirality of Möbius Ladders 15
Intrinsic Chirality 19
Euclidean Rubber Gloves 19
Topological Rubber Gloves 21
Nonrigid Symmetries 25
Exercises 29

2. Detecting Chirality 32
Defining Chirality 33
Knot and Link Types 39
Link Polynomials 41
Chirality of Embedded Graphs 48
Chirality of Molecular Knots and Links 52
Alternating Links 57
Tait's Conjecture 63
Exercises 66

3. Möbius Ladders and Related Molecular Graphs 69
Chirality of Möbius Ladders 69
Intrinsic Chirality 90
Triple-Layered Naphthalenophane 98
Multiply Twisted Closed Ladders 105
Exercises 107

4. Different Types of Chirality and Achirality 110
Topological Rubber Gloves in $\mathbb{R}^3$ 114
Molecular Topological Rubber Gloves 118
Intrinsic Topological Rubber Gloves 124
Hierarchies of Achirality 125
Molecular Cell Complexes 128
Exercises 134

5. Intrinsic Topological Properties of Graphs 136
Results of Conway and Gordon 137
Minor Minimal Intrinsically Linked Graphs 140
ΔY Moves and Intrinsic Knottedness 144
Intrinsic Chirality of Complete Graphs 148
Topological Stereoisomers 155
Exercises 160

6. Symmetries of Embedded Graphs 161
Nonrigid Symmetries 162
Rigid Symmetries of Three-Connected Graphs 163
Topological Chirality of Labeled Graphs 172
Using Automorphisms to Show Intrinsic Chirality 176
Symmetries of Complete Graphs 178
Hierarchies of Automorphisms 192
Exercises 195

7. Topology of DNA 198
Supercoiling 201
Toroidal Winding of DNA 207
The Action of Enzymes on DNA 210
Conway's Theory of Tangles 214
Results of Ernst and Sumners 219
Exercises 231

References 233
Index 239